3500

SERIES
User guide

ENG

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3508 and 3504 Process Controllers

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Issue status of this manual

Issue 7 section 4.19 - 'With Ethernet *or DeviceNet* module fitted product is only suitable for industrial environments, (class A emissions)'.

3508 and 3504 Process Controllers

1. Chapter 1 Installation

1.1 What Instrument Do I Have?

Thank you for choosing this Controller.

The 3508 controller is supplied in the standard 1/8 DIN size (48 x 96mm front panel). The 3504 controller is supplied in the standard ¼ DIN size (96 x 96mm front panel). They are intended for permanent installation, for indoor use only, in an electrical panel which encloses the rear housing, terminals and wiring on the back.

3508 Controller

3504 Controller

Whenever the symbol ☺ appears in this handbook it indicates a helpful hint

1.1.1 Contents of Package

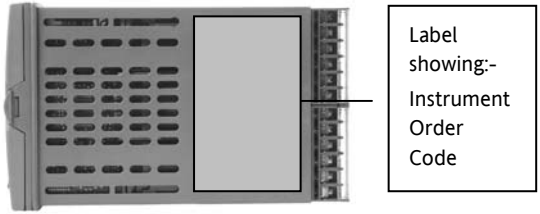
When unpacking your controller please check that the following items have been included.

1.1.1.1 3508 or 3504 Controller Mounted in its Sleeve

The 3504 contains up to six plug-in hardware modules; the 3508 has up to three. Additionally digital communications modules can be fitted in two positions.

The modules provide an interface to a wide range of plant devices and those fitted are identified by an ordering code printed on a label fixed to the side of the instrument. Check this against the description of the code given in section 1.2 to ensure that you have the correct modules for your application. This code also defines the basic functionality of the instrument which may be:-

- Controller only
- Programmer and controller
- Control type – Standard PID, valve positioner
- Digital communications type
- Options



1.1.1.2 Panel Retaining Clips

Two clips are required to secure the instrument sleeve in the panel. These are supplied fitted to the sleeve.

1.1.1.3 Accessories Pack

For each input a 2.49Ω resistor is supplied for mA measurement. This will need to be fitted across the respective input terminals

1.1.1.4 This User Guide

Issue 6 of this guide applies to instrument software versions, V2.30+, and explains:-

- How to install the controller
- Physical wiring to the plant devices
- First switch on - 'out of the box'.
- Principle of operation using the front panel buttons
- Introduction to configuration through iTools PC software
- Ethernet adaptor if Ethernet communications has been ordered

1.1.2 Accessories

The following accessories may be ordered:-

Engineering Manual This may also be downloaded from www.eurotherm.co.uk	HA027988
2.49Ω Precision resistor	SUB35/ACCESS/249R.1
Configuration IR Clip	ITools/None/30000IR
Configuration Clip	ITools/None/30000CK
10In,10Out IO Expander	2000IO/VL/10LR/XXXX
20In,20Out IO Expander	2000IO/VL/20LR/20LR

1.2 3504 and 3508 Ordering Code

The controller may have been ordered in accordance with the hardware code listed below. Alternatively, it may have been ordered by quoting the 'Quick Code' listed in section 1.4. If ordered to the quick code the controller will be configured in the factory. If it is not ordered using the quick code then it will be necessary to configure the controller when it is first switched on. This is described in Chapter 2.

Hardware/Options Coding

Model Number	Function	Supply Voltage	Number of Loops	Application	Programs	Recipes	Toolkits	Fascia

Model Number	
3504	3504 Standard
3508	3508 Standard

Supply Voltage	
VH	100-240Vac
VL	20-29Vac/dc

Programs	
X	No programs
1	1 prog 20 segments
10	10 prog 500 segments
25	25 prog 500 segments
50	50 prog 500 segments

Toolkit Wires	
XXX	Std 30 wires
60	60 wires
120	120 wires
250	250 wires

Function	
CC	Standard
F	Profibus

Loops	
1	One loop
2	Two loops

Recipes	
X	No recipe
1	1 recipe
4	4 recipes
8	8 recipes

Fascia	
G	Eurotherm green
S	Silver

Application	
XX	Standard
ZC	Zirconia
VP	Dual Valve Position (1)

(1) Provides Valve Position option in Heat/Cool applications. Single channel VP included as standard.

Example (order code)

3504/CC/VH/2/XX/50/X/S/R2/D4/AM/XX/XX/XX/A2/XX/XX/ENG/ENG/XXXXX/XXXXX

This code describes a two loop 3504 with 50 programs. Additionalmodules for dual relay, analogue control, analogue input and EIA232 communications. English language and manuals with silver fascia.

Input and Output Modules

I/O Slot 1	I/O Slot 2	I/O Slot 3	I/O Slot 4 (2)	I/O Slot 5 (2)	I/O Slot 6 (2)	H Comms Slot	J Comms Slot	Config Tools	Product Language	Manuals Language	Warranty	Calibration Certificate

IO Slots 1, 2, 3, 4 (2), 5 (2), 6 (2)	
XX	None fitted
R4	Change over relay
R2	2 pin relay
RR	Dual relay
T2	Triac
TT	Dual triac
D4	DC control
DO	Dual DC output 4-20mA OP/24Vdc. Slots 1, 2 and 4 only
AM	Analogue input (not slot 2 or 5)
D6	DC retransmission
TL	Triple logic input
TK	Triple contact input
TP	Triple logic output
VU	Potentiometer input
MS	24Vdc transmitter PSU
G3	Transducer PSU 5 or 10Vdc
LO	Isolated single logic output

H Comms Slot	
XX	Not Fitted
A2	232 Modbus
Y2	2-wire 485 Modbus
F2	4-wire 485 Modbus
AE	232 EI-Bisynch
YE	2-wire 485 EI-Bisynch
FE	4-wire 485 EI-Bisynch
ET	Ethernet 10base
PB	Profibus (3)
PD	Profibus with D type connector (3)
DN	Devicenet

J Comms Slot	
XX	Not Fitted
A2	232 Modbus
Y2	2-wire 485 Modbus
F2	4-wire 485 Modbus
EX	IO Expander

Config Tools	
XX	None
IT	Standard iTools (CD only)

Product Language	
ENG	English
FRA	French
GER	German
SPA	Spanish
ITA	Italian

Manuals Language	
ENG	English
FRA	French
GER	German
SPA	Spanish
ITA	Italian
XXX	None

Warranty	
XXXXX	Standard
WL005	Extended 5 year

Calibration Certificate	
XXXXX	None
CERT1	Cert of conformity
CERT2	Factory input calibration per input

(2). I/O slots 4, 5 and 6 are only available on the 3504

(3). Only available with the Profibus Controller

1.3 Configuration Code (Quick Start Code)

Loop 1

Config	Loop 1 Units	Loop 1 Function	Loop 1 PV	Loop 1 Range Lo	Loop 1 Range Hi

Config	
STD	Standard config (1)
CFG	Factory configured

Loop 1 units	
C	Centigrade
F	Fahrenheit
%	Percent
H	%RH
P	PSI
B	Bar
M	mBar
X	None

Loop 1 Function	
PX	Single Chan. PID
FX	Single Chan. VP with Feedback
VX	Single Chan. VP without Feedback
NX	Single Chan. On/Off
PP	Dual Chan. PID
PN	Dual Chan. PID/OnOff
FF	Dual Chan. VP with Feedback
VV	Dual Chan. VP without Feedback
PF	Dual Chan. PID/VP with Feedback
PV	Dual Chan. PID/VP without

Loop 1 PV	
X	Unconfigured
J	J Thermocouple
K	K Thermocouple
T	T Thermocouple
L	L Thermocouple
N	N Thermocouple
R	R Thermocouple
S	S Thermocouple
B	B Thermocouple
P	Platinell II
C	C Thermocouple
Z	Pt 100
A	4-20mA Linear
Y	0-20mA Linear
W	0-5Vdc Linear
G	1-5Vdc Linear
V	0-10Vdc Linear
Q	Custom Curve

Loop 1 Range Low	
XXXXX	Enter value with decimal point

Loop 1 Range High	
XXXXX	Enter value with decimal point

1. If standard config is selected an instrument without configuration will be supplied.

Loop 2

Loop 2 Units	Loop 2 Function	Loop 2 PV	Loop 2 Range Lo	Loop 2 Range Hi

Loop 2 Units	
C	Centigrade (2)
F	Fahrenheit (2)
%	Percent
H	%RH
P	PSI
B	Bar
M	mBar
X	None

Loop 2 Function	
XX	Single Loop Only
PX	Single Chan. PID
FX	Single Chan. VP with Feedback
VX	Single Chan. VP without Feedback
NX	Single Chan. On/Off
PP	Dual Chan. PID
PN	Dual Chan. PID/OnOff
FF	Dual Chan. VP with Feedback
VV	Dual Chan. VP without Feedback
PF	Dual Chan. PID/VP with Feedback
PV	Dual Chan. PID/VP without

Loop 2 PV	
X	Unconfigured
J	J Thermocouple
K	K Thermocouple
T	T Thermocouple
L	L Thermocouple
N	N Thermocouple
R	R Thermocouple
S	S Thermocouple
B	B Thermocouple
P	Platinell II
C	C Thermocouple
Z	Pt 100
A	4-20mA Linear
Y	0-20mA Linear
W	0-5Vdc Linear
G	1-5Vdc Linear
V	0-10Vdc Linear
Q	Custom Curve

Loop 2 Range Low	
XXXXX	Enter value with decimal point

Loop 2 Range High	
XXXXX	Enter value with decimal point

(2). If C or F units are selected they must be the same for both loops.
If C or F are not selected for Loop 1 they cannot be selected for Loop 2

Alarms and Input/Outputs

Alarm 1	Alarm 2	Alarm 3	Alarm 4	Logic LA	Logic LB	Relay AA	I/O Slot 1	I/O Slot 2	I/O Slot 3	I/O Slot 4 (3)	I/O Slot 5 (3)	I/O Slot 6 (3)

Alarm 1	
XXX	Unconfigured
1_ _	**Loop 1**
2_ _	**Loop 2**
_FH	Full scale high
_FL	Full scale low
_DH	Deviation high
_DL	Deviation low
_DB	Deviation band

Alarm 2	
XXX	Unconfigured
1_ _	**Loop 1**
2_ _	**Loop 2**
_FH	Full scale high
_FL	Full scale low
_DH	Deviation high
_DL	Deviation low
_DB	Deviation band

Alarm 3	
XXX	Unconfigured
1_ _	**Loop 1**
2_ _	**Loop 2**
_FH	Full scale high
_FL	Full scale low
_DH	Deviation high
_DL	Deviation low
_DB	Deviation band

Alarm 4	
XXX	Unconfigured
1_ _	**Loop 1**
2_ _	**Loop 2**
_FH	Full scale high
_FL	Full scale low
_DH	Deviation high
_DL	Deviation low
_DB	Deviation band

Logic LA	
XX	Unconfigured
1_	**Loop 1**
2_	**Loop 2**
_B	Sensor Break
_M	Manual Select
_H	Control Ch1 OP
_C	Control Ch2 OP
_R	Remote SP
_S	Setpoint 2 Enable
A_	**Alarm**
_A	Acknowledge All Alarms
_1	Alarm 1 OP
_2	Alarm 2 OP
P_	**Programmer**
_R	Run
_H	Hold
_A	Reset
_1	Prg Ch1 Event 1
_2	Prg Ch1 Event 2

Logic LB	
XX	Unconfigured
1_	**Loop 1**
2_	**Loop 2**
_B	Sensor Break
_M	Manual Select
_H	Ch1 OP
_C	Ch2 OP
_R	Remote SP
_S	Setpoint 2 Enable
A_	**Alarm**
_A	Acknowledge All Alarms
_1	Alarm 1 OP
_2	Alarm 2 OP
P_	**Programmer**
_R	Run
_H	Hold
_A	Reset
_1	Prg Event 1
_2	Prg Event 2

Relay AA	
XX	Unconfigured
1_	**Loop 1**
2_	**Loop 2**
_H	Control Ch1 OP
_C	Control Ch2 OP
_B	Sensor Break
SB	Sensor Break (any loop)
A_	**Alarm**
_A	Any Alarm Active
_N	New Alarm Active
_1	Alarm 1 OP
_2	Alarm 2 OP
P_	**Programmer**
_1	Prg Event 1
_2	Prg Event 2

(3). I/O slots 4, 5 and 6 are only available on the 3504.

Slot Functions 1 – 6 CH1 = Heat, CH2 = Cool	
XXX	Unconfigured
1_ _	**Loop 1**
2_ _	**Loop 2**
Changeover Relay	
_HX	Control Ch1 OP
_CX	Control Ch2 OP
_BX	Sensor Break
2-Pin Relay	
_HX	Control Ch1 OP
_CX	Control Ch2 OP
_BX	Sensor Break
Single Logic	
_HX	Control Ch1 OP
_CX	Control Ch2 OP
Single Triac	
_HX	Control Ch1 OP
_CX	Control Ch2 OP
Dual Relay	
_HC	Ch1 OP & Ch2
_VT	VP Ch1
_VR	VP Ch2
P12	Prg Event 1 & 2
P34	Prg Event 3 & 3
P56	Prg Event 5 & 6
P78	Prg Event 7 & 8
A12	Alarm 1 & 2 OP
A34	Alarm 3 & 4 OP
HHX	Ch1 OP for loops 1 & 2
CCX	Ch2 OP for loops 1 & 2
SBR	Sensor Break both loops
Dual Triac	
_HC	Ch1 OP & Ch2
_VT	VP Ch1
_VR	VP Ch2
P12	Prg Ch1 Event 1 & 2
P34	Prg Ch1 Event 3 & 3
P56	Prg Ch1 Event 5 & 6
P78	Prg Ch1 Event 7 & 8
A12	Alarm 1 & 2 OP
A34	Alarm 3 & 4 OP
HHX	Ch1 OP for loops 1 & 2
CCX	Ch2 OP for loops 1 & 2
DC Control	
_H_	Ch1 OP
_C_	Ch2 OP
DC Retransmission *	
_T_	PV Retransmission
_S_	SP Retransmission
Analogue Input *	
2PV	Loop 2 PV
_R_	Remote SP
Potentiometer Input *	
_RS	Remote SP
_VF	VP Feedback Ch1
_VG	VP Feedback Ch2
Triple Logic Input	
_ _ _	Select function below for each channel
X	Unconfigured
M	Loop 1 Manual
N	Loop 2 Manual
Q	Loop 1 Remote SP
V	Loop 2 Remote SP
S	Loop 1 Setpoint 2
T	Loop 2 Setpoint 2
E	Acknowledge All Alarms
P	Program Run
R	Program Reset
H	Program Hold
Triple Logic OP	
_ _ _	Select function below for each channel
X	Unconfigured
F	Loop 1 Ch1 OP
G	Loop 1 Ch2 OP
K	Loop 2 Ch1 OP
L	Loop 2 Control Ch2 OP
A	Alarm 1 OP
B	Alarm 2 OP
C	Alarm 3 OP
D	Alarm 4 OP
1	Program Event 1
2	Program Event 2
3	Program Event 3
4	Program Event 4
5	Program Event 5
6	Program Event 6
7	Program Event 7
8	Program Event 8

* For range, select from Table A below

Table 1	
A	4-20mA Linear
Y	0-20mA Linear
W	0-5Vdc Linear
G	1-5Vdc Linear
V	0-10Vdc Linear

1.4 How to Install the Controller

This instrument is intended for permanent installation, for indoor use only, and to be enclosed in an electrical panel.

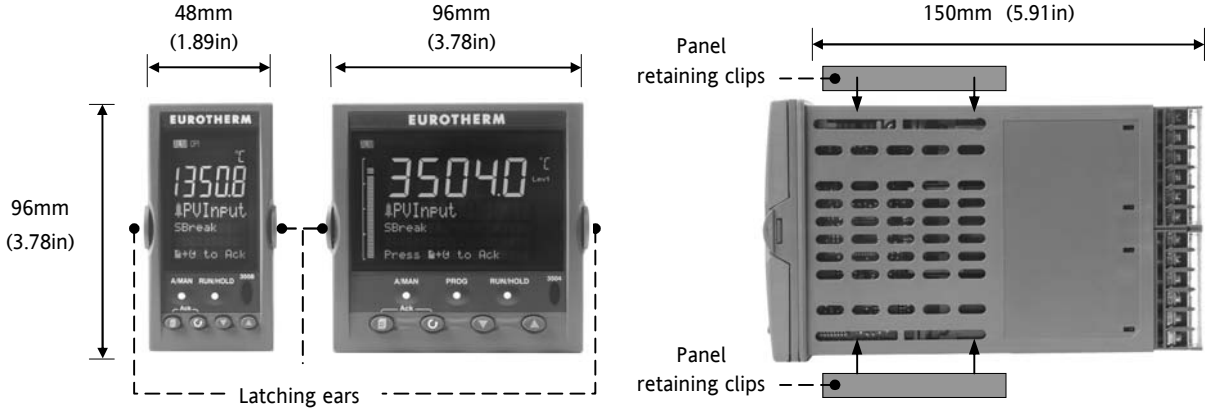
Select a location where minimum vibrations are present and the ambient temperature is within 0 and 50°C (32 and 122°F).

The instrument can be mounted on a panel up to 15mm thick.

To assure IP65 and NEMA 4 front protection, use a panel with smooth surface texture.

Please read the safety information, at the end of this guide, before proceeding and refer to the EMC Booklet part number HA025464 for further information. This and other relevant manuals may be downloaded from www.eurotherm.co.uk.

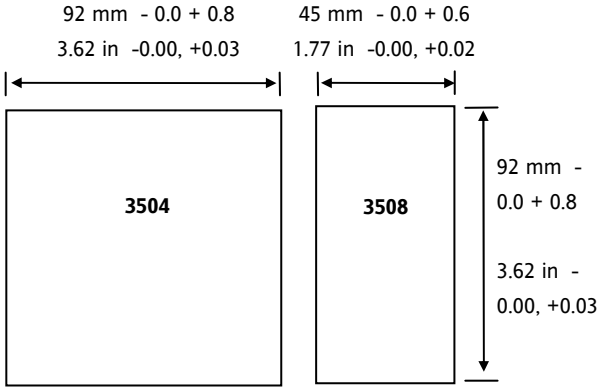
1.4.1 Dimensions



1.4.2 To Install the Controller

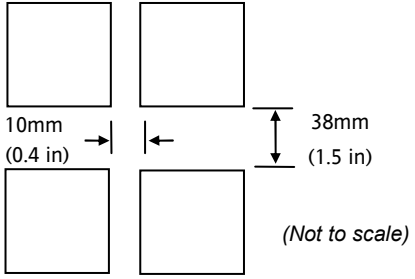
1.4.2.1 Panel Cut-out

1. Prepare the panel cut-out to the size shown in the diagram
2. Insert the controller through the cut-out.
3. Spring the panel retaining clips into place. Secure the controller in position by holding it level and pushing both retaining clips forward.
4. Peel off the protective cover from the display



1.4.2.2 Recommended Minimum Spacing

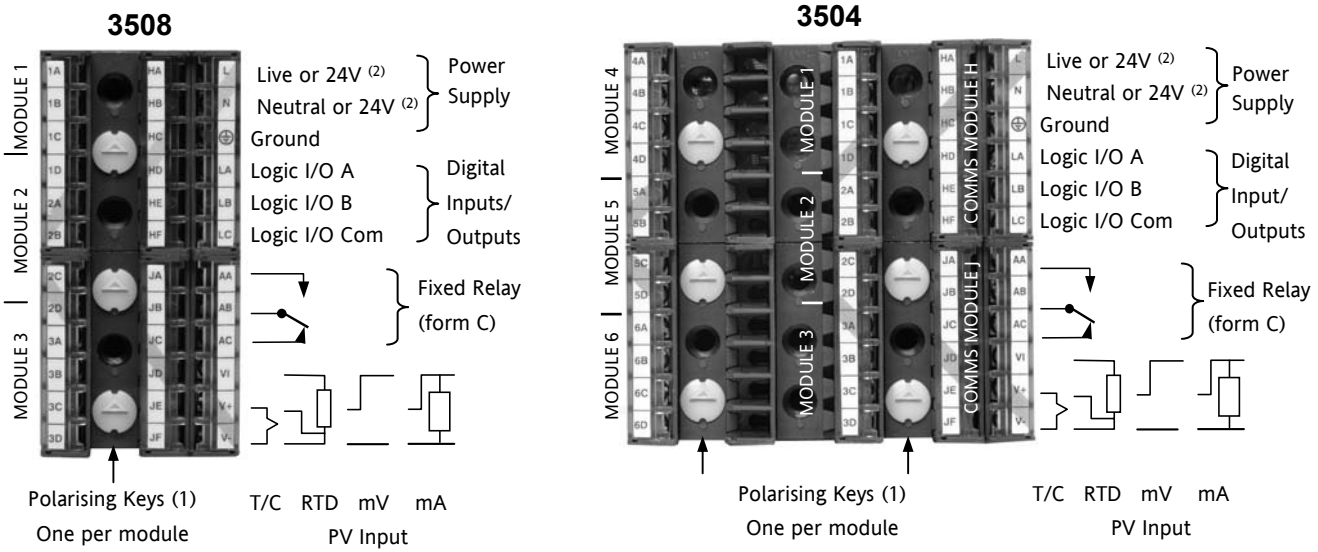
5. The recommended minimum spacing between controllers shown here should not be reduced to allow sufficient natural air flow



1.4.3 Unplugging the Controller

The controller can be unplugged from its sleeve by easing the latching ears outwards and pulling it forward out of the sleeve. When plugging it back into its sleeve, ensure that the latching ears click back into place to maintain the IP65 sealing.

1.5 Electrical Connections



(1) Polarising keys are intended to prevent modules which are not supported in this controller from being fitted into the controller. An example might be an unisolated module (coloured red) from a 2400 controller series. When pointing towards the top, as shown, the key prevents a controller, fitted with an unsupported module, from being plugged into a sleeve which has been previously wired for isolated modules. If an unisolated module is to be fitted, it is the users responsibility to ensure that it is safe to install the controller in the particular application. When this has been verified the polarising key may be adjusted with a screwdriver to point in the down direction.

(2) High or low voltage versions are orderable. Ensure you have the correct version

1.5.1 Wire Sizes

The screw terminals accept wire sizes from 0.5 to 1.5 mm (16 to 22AWG). Hinged covers prevent hands or metal making accidental contact with live wires. The rear terminal screws should be tightened to 0.4Nm (3.5lb in).

1.6 Standard Connections

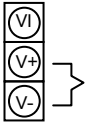
These are connections which are common to all instruments in the range.

1.6.1 PV Input (Measuring Input)

Notes:

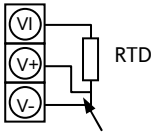
1. Do not run input wires together with power cables
2. When shielded cable is used, it should be grounded at one point only
3. Any external components (such as zener barriers, etc) connected between sensor and input terminals may cause errors in measurement due to excessive and/or un-balanced line resistance or possible leakage currents
4. Not isolated from logic I/O A and logic I/O B

1.6.1.1 Thermocouple or Pyrometer Input



Use the correct type of thermocouple compensating cable, preferably shielded, to extend wiring

1.6.1.2 RTD Input



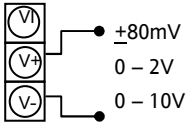
For 2-wire this is a local link

The resistance of the three wires must be the same

The line resistance may cause errors if it is greater than 22Ω

Note: the RTD wiring is not the same as 2400 series instruments. It is the same as 26/2700 series

1.6.1.3 Linear Input V, mV and High Impedance V



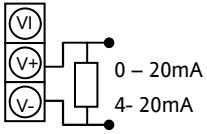
mV range ±40mV or ±80mV

High level range 0 – 10V

High Impedance mid level range 0 – 2V

A line resistance for voltage inputs may cause measurement errors

1.6.1.4 Linear Input mA



Connect the supplied load resistor equal to 2.49Ω for mA input

The resistor supplied is 1% accuracy 50ppm

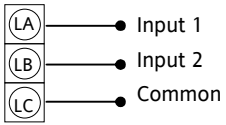
A resistor 0.1% accuracy 15ppm resistor can be ordered as a separate item

1.6.2 Digital I/O

These terminals may be configured as logic inputs, contact inputs or logic outputs in any combination. It is possible to have one input and one output on either channel.

⚠ **The Digital IO is not isolated from the PV input**

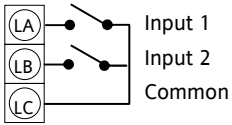
1.6.2.1 Logic Inputs



Voltage level logic inputs, 12V, 5-40mA

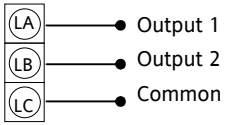
Active > 10.8V
Inactive < 7.3V

1.6.2.2 Contact Closure Inputs



Contact open > 1200Ω
Contact closed < 480Ω

1.6.3 Digital (Logic) Outputs

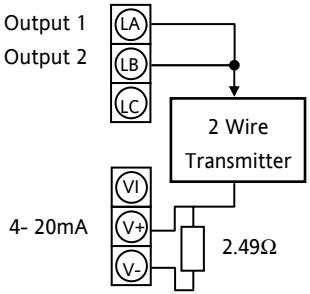


The logic outputs are capable of driving SSR or thyristors up to 9mA, 18V
It is possible to parallel the two outputs to supply 18mA, 18V.

Note : The Digital IO terminals are not isolated from the PV.

The fixed digital logic outputs may be used to power remote 2 wire transmitters. The fixed digital I/O are, however, not isolated from the PV input circuit, so this does not allow the use of 3 or 4 wire transmitters. An isolated module must be used for the 3 and 4 wire types.

1.6.4 Digital (Logic) Outputs used to power a remote 2 wire transmitter.

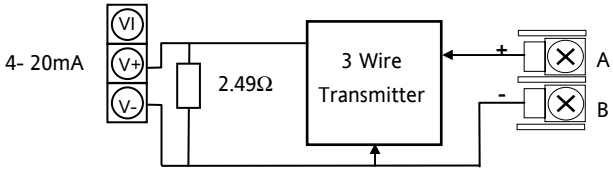


The parallel logic outputs supply >20mA, 18V.

Note : The Digital IO terminals are not isolated from the PV.

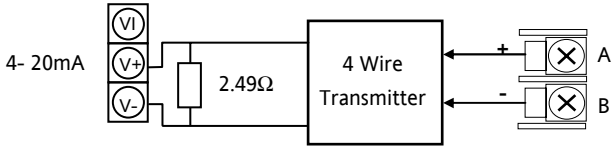
Connect the supplied load resistor equal to 2.49Ω for mA input

1.6.5 Digital (Logic) Outputs used to power a remote 3 wire transmitter.



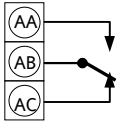
Isolated Transmitter Option module +24V >20mA

1.6.6 Digital (Logic) Outputs used to power a remote 4 wire transmitter.



Isolated Transmitter Option module +24V >20mA

1.6.7 Relay Output



Relay rating, min: 1V, 1mAdc. Max: 264Vac 2A resistive

Relay shown in de-energised state

Isolated output 240Vac CATII

1.6.7.1 General Note About Inductive Loads

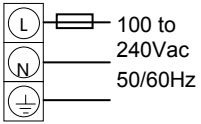
High voltage transients may occur when switching inductive loads such as some contactors or solenoid valves.

For this type of load it is recommended that a 'snubber' is connected across the contact of the relay switching the load. The snubber typically consists of a 15nF capacitor connected in series with a 100Ω resistor and will also prolong the life of the relay contacts.

⚠ When the relay contact is open and it is connected to a load, the snubber passes a current (typically 0.6mA at 110Vac and 1.2mA at 240Vac. It is the responsibility of the installer to ensure that this current does not hold on the power to an electrical load. If the load is of this type the snubber should not be connected.

See also section 1.7.9.

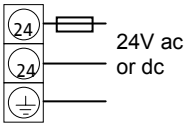
1.6.8 Power Supply Connections



1. Before connecting the instrument to the power line, make sure that the line voltage corresponds to the description on the identification label
2. For supply connections use 16AWG or larger wires rated for at least 75ºC
3. Use copper conductors only
4. For 24V the polarity is not important
5. It is the Users responsibility to provide an external fuse or circuit breaker.

   For 24 V ac/dc fuse type T rated 4A 250V

   For 100/240Vac fuse type T rated 1A 250V



Safety requirements for permanently connected equipment state:

- a switch or circuit breaker shall be included in the building installation
- it shall be in close proximity to the equipment and within easy reach of the operator
- it shall be marked as the disconnecting device for the equipment

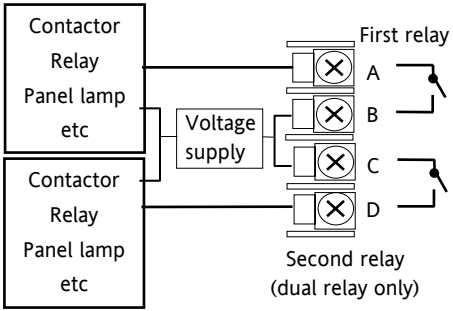
Note: a single switch or circuit breaker can supply more than one instrument

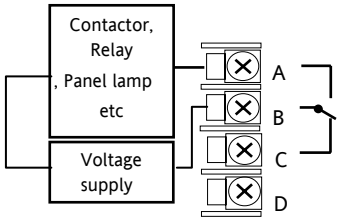
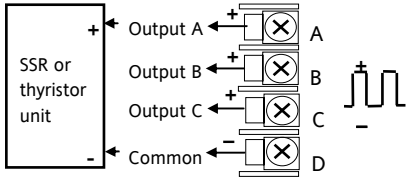
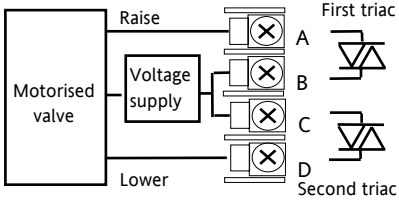
1.7 Plug in I/O Module Connections

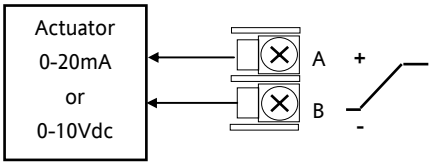
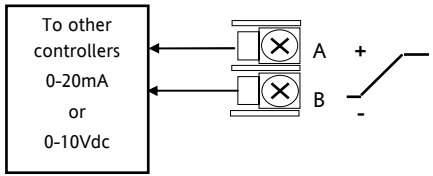
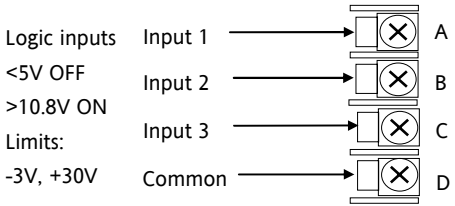
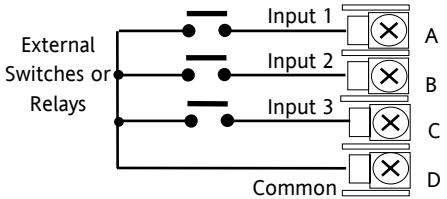
Plug in I/O modules can be fitted in three positions in the 3508 and six positions in 3504. The positions are marked Module 1, 2, 3, 4, 5, 6. With the exception of the Analogue Input module, any other module listed in this section, can be fitted in any of these positions. To find out which modules are fitted check the ordering code printed on a label on the side of the instrument. If modules have been added, removed or changed it is recommended that this is recorded on the instrument code label.

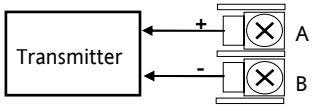
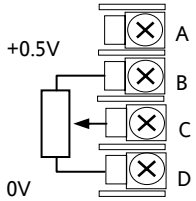
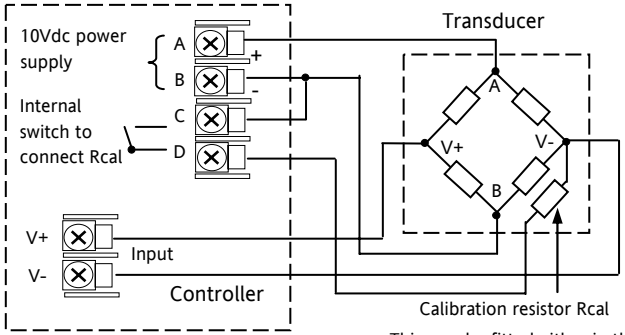
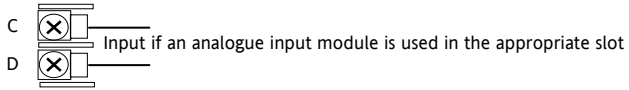
The function of the connections varies depending on the type of module fitted in each position and this is shown below. All modules are isolated.

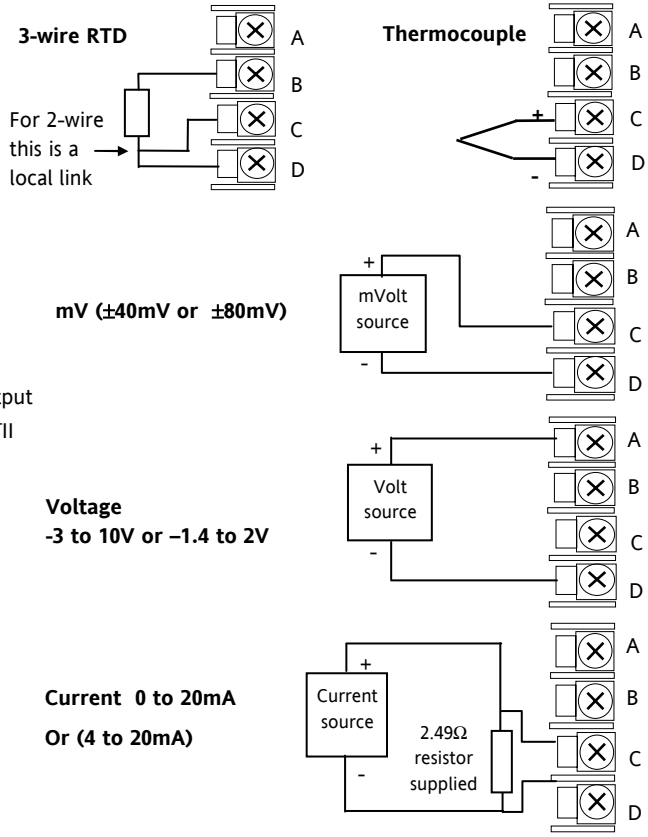
1.7.1 I/O Modules

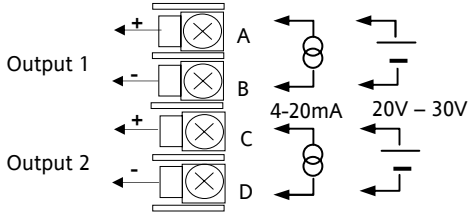
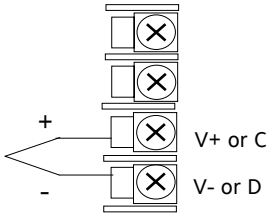
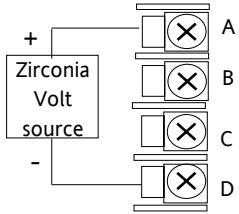
I/O Module	Typical usage	H/W Code	Connections and examples of use
Note: The order code and terminal number is pre-fixed by the module number. Module 1 is connected to terminals 1A, 1B, 1C, 1D; module 2 to 2A, 2B, 2C, 2D, etc.			
Relay (2 pin) and Dual Relay 2A, 264Vac max 1mA 1V min	Heating, cooling, alarm, program event, valve raise, valve lower	R2 and RR	 Isolated output 240Vac CATII

I/O Module	Typical usage	H/W Code	Connections and examples of use
Change Over Relay (2A, 264Vac max) 1mA 1V min	Heating, cooling, alarm, program event, valve raise, valve lower	R4	 Isolated output 240Vac CATII
Triple Logic and Isolated Single Logic Output (18Vdc at 8mA max.)	Heating, cooling, program events	TP and LO	Single Logic Output connections are:- D – Common A – Logic Output  Isolated output 240Vac CATII
Triac and Dual Triac (0.7A, 30 to 264Vac combined rating)	Heating, cooling, valve raise, valve lower	T2 and TT	 Isolated output 240Vac CATII Note 1: Dual relay modules may be used in place of dual triac. **Note 2:- The combined current rating for the two triacs must not exceed 0.7A.**

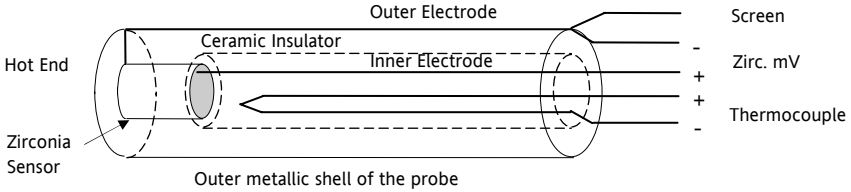
I/O Module	Typical usage	H/W Code	Connections and examples of use
DC Control (10Vdc, 20mA max)	Heating, cooling e.g. to a 4-20mA process actuator	D4	Isolated output 240Vac CATII 
DC Re-transmission (10Vdc, 20mA max)	Logging of PV, SP, output power, etc., (0 to 10Vdc, 0 to 20mA)	D6	Isolated output 240Vac CATII 
Triple Logic Input	Events e.g. Program Run, Reset, Hold	TL	Isolated output 240Vac CATII 
Triple Contact Input	Events e.g. Program Run, Reset, Hold	TK	Contact inputs <100Ω ON >28KΩ OFF Isolated output 240Vac CATII 

I/O Module	Typical usage	H/W Code	Connections and examples of use
24V Transmitter Supply (20mA)	To power an external transmitter	MS	 Isolated output 240Vac CATII
Potentiometer input 100Ω to 15KΩ	Valve position feedback Remote setpoint	VU	 Isolated output 240Vac CATII
Transducer Power Supply Configurable 5V or 10Vdc Minimum load resistance 300Ω		G3	 Isolated output 240Vac CATII 

I/O Module	Typical usage	H/W Code	Connections and examples of use
Analogue Input (T/C & RTD) **Modules 1, 3, 4 & 6 only** (mV, V and mA)	Second PV input Remote setpoint	AM	

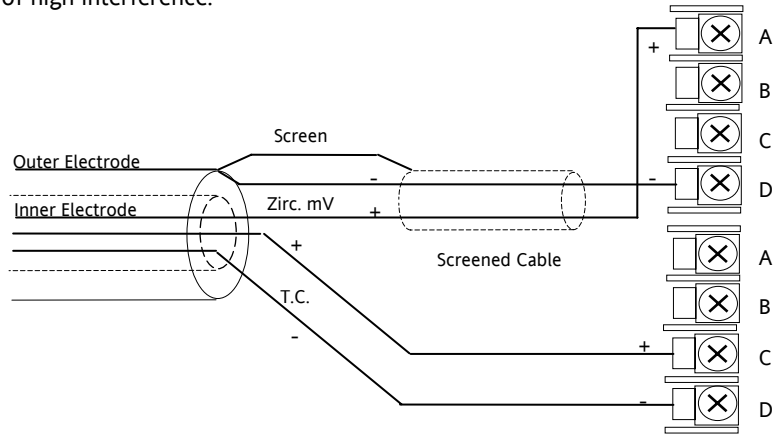
I/O Module	Typical usage	H/W Code	Connections and examples of use
Dual DC Output (each channel can be 4-20mA or 24Vdc power supply)	Control output 12 bit resolution Can only be fitted in slots 1, 2 and 4	DO	
Analogue Input (T/C & RTD) **Modules 1, 3, 4 & 6 only**	Zirconia Probe	AM	The temperature sensor of the zirconia probe can be connected to the Fixed PV input, terminals V+ and V-, or to an Analogue Input module, terminals C & D. The Volt Source connected to an Analogue Input module, terminals A & D.  Fixed PV (or an Analogue Input Module)  Analogue Input Module Isolated output 240Vac CATII

1.7.2 Zirconia Probe Construction



1.7.3 Zirconia Probe Screening Connections

The zirconia sensor wires should be screened and connected to the outer shell of the probe if it is situated in an area of high interference.



1.8 Digital Communications Connections

Digital Communications modules can be fitted in two positions in both 3508 and 3504 controllers. The connections being available on HA to HF and JA to JF depending on the position in which the module is fitted. The two positions could be used, for example, to communicate with 'iTools' configuration package on one position, and to a PC running a supervisory package on the second position.

Communications protocols may be ModBus, EIBisynch, DeviceNet, Profibus or ModBus TCP.

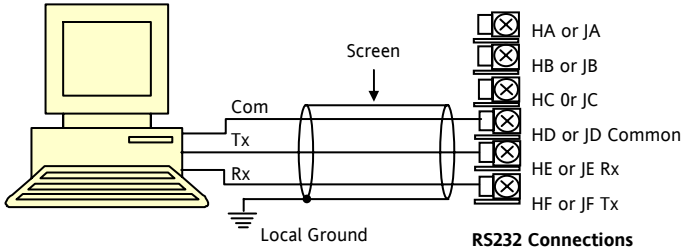
Note:- In order to reduce the effects of RF interference the transmission line should be grounded at both ends of the screened cable. However, if such a course is taken care must be taken to ensure that differences in the earth potentials do not allow circulating currents to flow, as these can induce common mode signals in the data lines. Where doubt exists it is recommended that the Screen (shield) be grounded at only one section of the network as shown in all of the following diagrams.

- Digital communications modules isolated 240Vac CATII

1.8.1 Modbus Slave (H or J Module) or EIBisynch

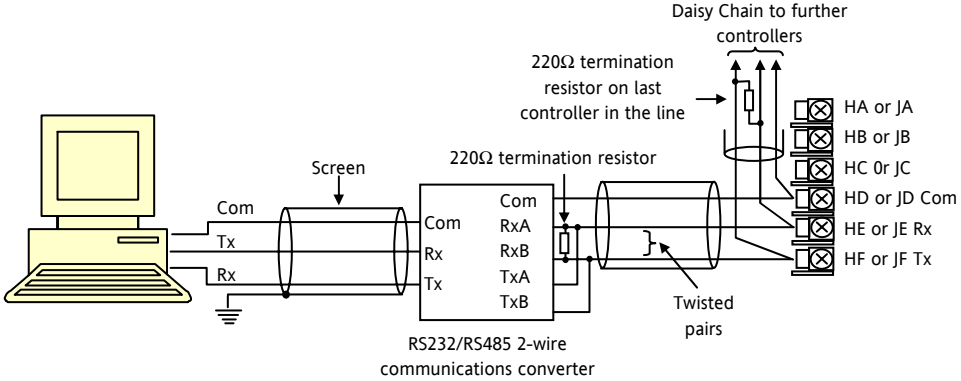
A further description of ModBus and EIBisynch communications is given in 2000 series Communications Handbook, Part No. HA026230, which can be downloaded from www.eurotherm.co.uk.

RS232 Connections



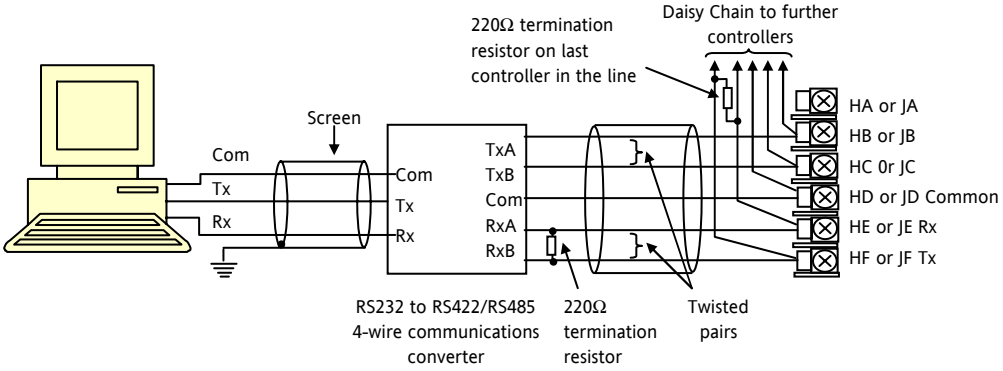
RS232 Connections

RS485 2-Wire Connections



The KD485 communications converter is recommended for interfacing to RS485. This unit is also used to buffer an RS485 network when it is required to communicate with more than 32 instruments on the same bus, and may also be used to bridge 2-wire RS485 to 4-wire RS422.

RS422/RS485 4-Wire Connections



The 261 or KD485 communications converter is recommended for:

Interfacing 4-wire to 2-wire connections.

To buffer an RS422/485 network when more than 32 instruments on the same bus are required

To bridge 2-wire RS485 to 4-wire RS422.

1.8.2 DeviceNet Wiring

A description of DeviceNet is given in the DeviceNet Communications Handbook Part No HA027506 which can be downloaded from www.eurotherm.co.uk.

Terminal Reference	CAN Label	Color Chip	Description
HA	V+	Red	DeviceNet network power positive terminal. Connect the red wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the positive terminal of an external 11-25 Vdc power supply.
HB	CAN_H	White	DeviceNet CAN_H data bus terminal. Connect the white wire of the DeviceNet cable here.
HC	SHIELD	None	Shield/Drain wire connection. Connect the DeviceNet cable shield here. To prevent ground loops, the DeviceNet network should be grounded in only one location.
HD	CAN_L	Blue	DeviceNet CAN_L data bus terminal. Connect the blue wire of the DeviceNet cable here.
HE	V-	Black	DeviceNet network power negative terminal. Connect the black wire of the DeviceNet cable here. If the DeviceNet network does not supply the power, connect to the negative terminal of an external 11-25 Vdc power supply.
HF			Connect to instrument earth

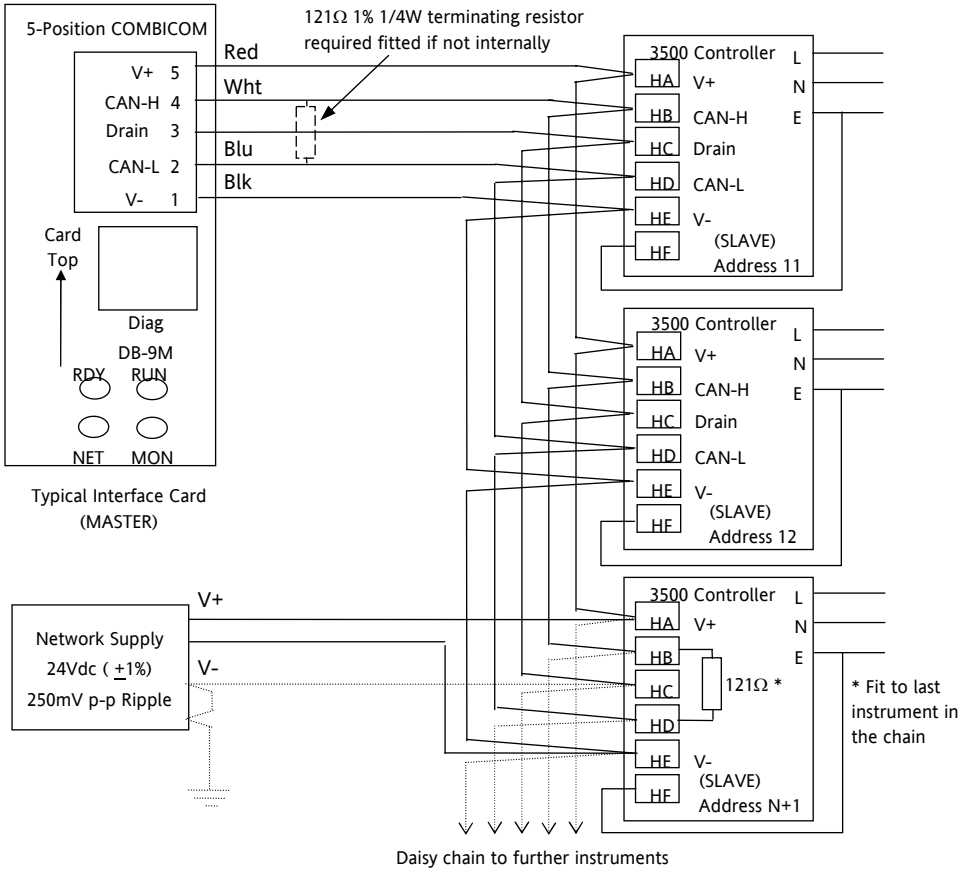
Note: Power taps are recommended to connect the DC power supply to the DeviceNet trunk line. Power taps include:

A Schottky Diode to connect the power supply V+ and allows for multiple power supplies to be connected.

2 fuses or circuit breakers to protect the bus from excessive current which could damage the cable and connectors.

The earth connection, HF, to be connected to the main supply earth terminal.

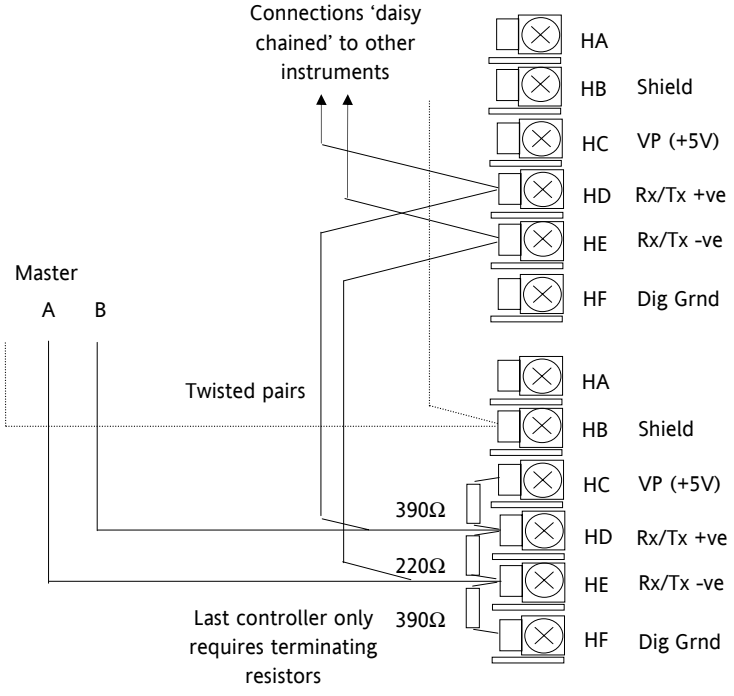
1.8.3 Example DeviceNet Wiring Diagram



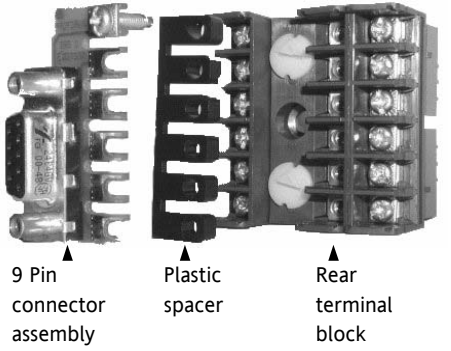
1.8.4 Profibus

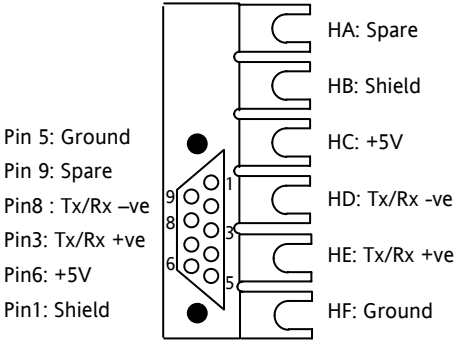
A description of Profibus is given in the Profibus Communications Handbook Part No HA026290 which can be downloaded from www.eurotherm.co.uk.

1.8.5 Example Profibus Wiring



D Type Connector for rear terminal mounting if digital communications options code PD is ordered

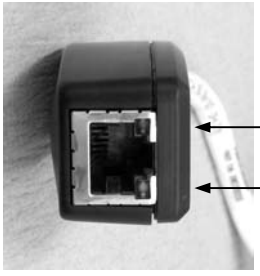




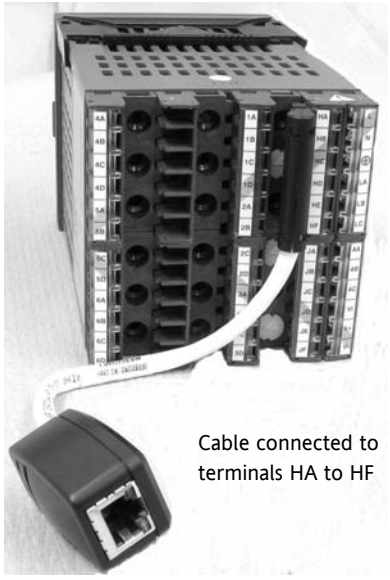
1.8.6 Ethernet (ModBus TCP)

When the controller is supplied with the Ethernet communications option a special cable assembly is also supplied. This cable must be used since the magnetic coupling is contained within the RJ45 connector. It consists of an RJ45 connector (socket) and a termination assembly which must be connected to terminals HA to HF.

View of cable which may also be ordered separately as Part No SUB3500/COMMS/EA



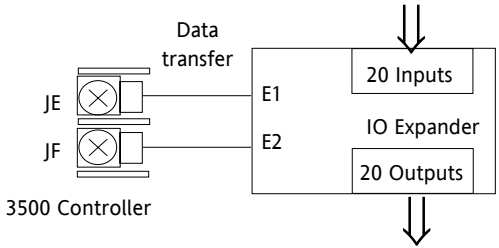
Activity and transmit data LED indicators



Cable connected to terminals HA to HF

1.8.7 I/O Expander

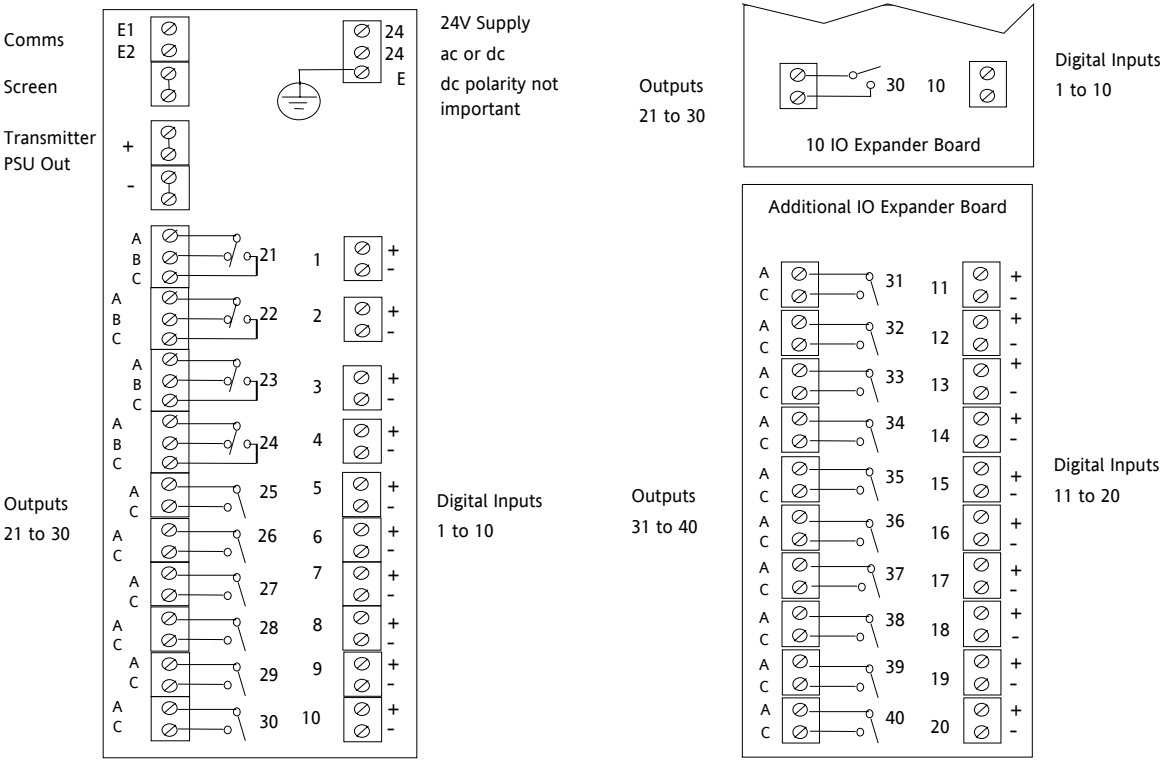
An I/O expander (Model No 2000IO) can be used with 3500 series controllers to allow the number of I/O points to be increased by up to a further 20 digital inputs and 20 digital outputs. Data transfer is performed serially via a two wire interface module which is fitted in digital communications slot J.



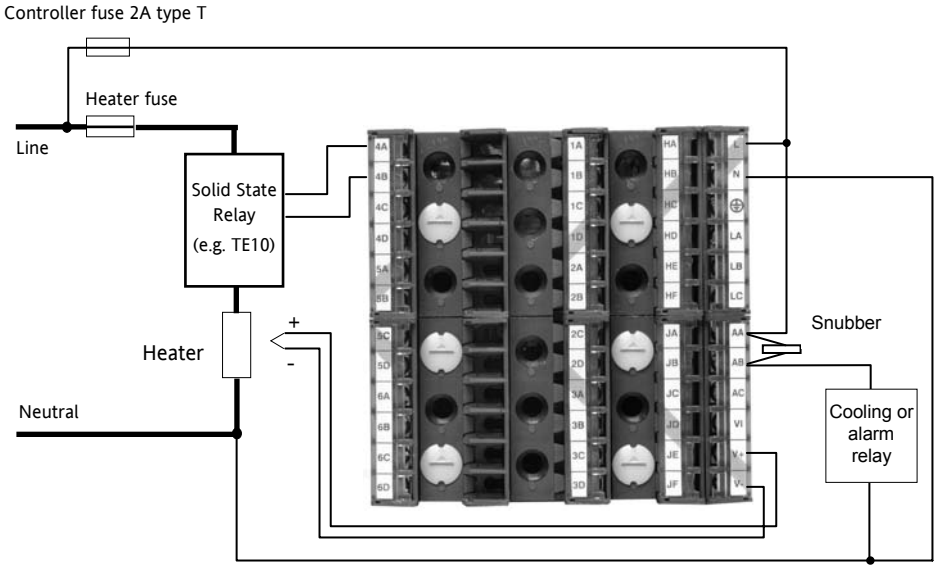
A description of the IO Expander is given in Handbook Part No HA026893 which can be downloaded from www.eurotherm.co.uk.

The connections for this unit are reproduced below for convenience.

1.8.8 IO Expander Connections



1.8.9 Example Wiring Diagram



Please refer to the EMC Electromagnetic Compatibility Handbook Part No. HA025464 for details of good wiring practice. This can be downloaded from www.eurotherm.co.uk.

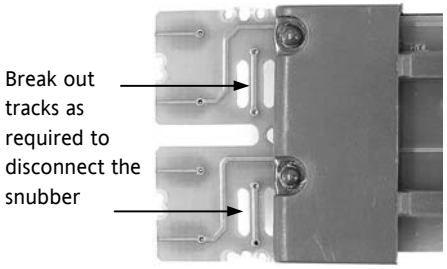
1.8.10 Snubbers

Snubbers are used to prolong the life of relay contacts and to reduce interference when switching inductive devices such as contactors or solenoid valves. The fixed relay (terminals AA/AB/AC) is not fitted internally with a snubber and it is recommended that a snubber be fitted externally, as shown in the example wiring diagram. If the relay is used to switch a device with a high impedance input, no snubber is necessary.

All relay modules are fitted internally with a snubber since these are generally required to switch inductive devices. However, snubbers pass 0.6mA at 110V and 1.2mA at 230Vac, which may be sufficient to hold on high impedance loads. If this type of device is used it will be necessary to remove the snubber from the circuit.

The snubber is removed from the relay module as follows:-

1. Unplug the controller from its sleeve
2. Remove the relay module
3. Use a screwdriver or similar tool to snap out the track. The view below shows the tracks in a Dual Relay Output module.



2. Chapter 2: Getting Started

A brief start up sequence consists of a self test in which all elements of the display are illuminated and the software version is shown. What happens next depends on one of two conditions;-

1. Power up out of the box – when the controller has no preset configuration and is switched on for the very first time it will start up in 'QuickStart mode. This is an intuitive tool for configuring the controller and is described in section 2.1 below.
2. The controller has been powered up previously and is already configured. In this case go to section 2.3.

2.1 Quick Start - New Controller (Unconfigured)

Quick Start is a tool which enables the controller to be matched to the most common processes without the need to go to full configuration level described in the Engineering Manual Part No. HA027988.

Manual mode, section 2.6, is always selected when in Quick Start mode because the controller resets to cold start when Quick Start is selected.

When the controller is switched on for the very first time it will display the 'Startup' screen shown below.

3504 Display

3508 Display

⚠ **Incorrect configuration can result in damage to the process and/or personal injury and must be carried out by a competent person authorised to do so. It is the responsibility of the person commissioning the controller to ensure the configuration is correct**

2.1.1 To Configure Parameters in Quick Start Mode

With 'QckStart' selected, press ⟳ to scroll through the list of parameters

Edit the parameters using the ▲ or ▼ buttons

Each time ⟳ button is pressed a new parameter will be presented

This is illustrated by the following example:- (The views shown are taken from the 3504 controller).

☺ From the Startup view, shown in the previous section, you can press ▲ or ▼ to select Configuration Mode. To fully configure the controller refer to the Engineering Handbook Part No HA027988.

☺ Backscroll – to scroll back through parameters press and hold ⟳ then press ▲ to go back through the list of parameters. You can also press and hold ⟳ + ▼ to go forward - this has the same effect as pressing ⟳ alone.

Example

Do This	Display	Additional Notes
1. From the Start view press ⟳ 2. Press ▲ or ▼ to change the **'Units'** 3. A different parameter is selected each time ⟳ is pressed.		The first parameter to be configured is **'Units'**. It resides in the '**PV Input List'** because it is associated with the process variable. When the required choice is selected a brief blink of the display indicates that it has been accepted
4. Continue setting up the parameters presented until the **'Finished'** view is displayed. 5. If all parameters are set up as required press ▲ or ▼ to **'Yes'**		If you wish to scroll around the parameters again do not select Yes but continue to press ⟳. When you are satisfied with the selections select 'Yes'. The 'HOME' display - section 2.3 is then shown.

The following table summarises all the parameters which can be set up by the above procedure.

2.1.2 Quick Start Parameters

Parameters shown in **Bold** are defaults.

Group	Parameter	Value	Availability
LP1 PV Input	Units Used to select the engineering units for the PV. (C, F, K options also change the displayed units)	**C**, F, K V. mV, A, mA, pH, mmHg, psi, Bar, mBar, %RH, %, mmWG, inWG, inWW, Ohms, PSIG, %O2, PPM, %CO2, %CP, %/sec, Vacuum, sec, min, hrs, None	Always
LP1 PV Input	Resolution Used to select the required decimal point position for the PV	**XXXXX**, XXXX.X, XXX.XX, XX.XXX, X.XXXX	Always
LP1 PV Input	Range Type Used to select the linearisation algorithm required and the input sensor.	Thermocouple: J, **K**, L, R, B, N, T, S, PL2, C, CustC1(2&3) RTD: Pt100 Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA	Always
LP1 PV Input	IO Type Only shown if custom curve is selected	Thermocpl, RTD, Pyrometer, mV40, mV80, mA, Volts, HIZVolts, Log10	
LP1 PV Input	Range High/Low Configures the maximum/minimum display range and SP limits	Depends on Range type selected. Default **1372/-200**	Always
LP1 Loop	Control Channel 1. Sets the control type for channel 1 (normally Heat)	**PID,** VPU, VPB, Off, OnOff	Always
LP1 Loop	Control Channel 2. Sets the control type for channel 2 (normally Cool)	PID, VPU, VPB, **Off,** OnOff	Always
LP2 PV Input	Source Defines where the PV input is wired to	**None,** FixedPV, Module6. Available only if an analogue input module is fitted.	If a dual loop controller
The LP1 parameters listed above are repeated for LP2 if the LP2 PV Input is configured			

Group	Parameter	Value	Availability
Init LgcIO LA	Logic function (input or output) The LA Logic I/O port can be an output or an input. This parameter is used to select its function.	**Not Used,** Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvnt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*, (outputs) LP1 A-M, LP1 SPsel, LP2 A-M, LP2 SPsel, AlarmAck, ProgRun, ProgReset, ProgHold (Inputs)	[Note 1] [Note 2] * LP2 and LPs (both loops) only shown if the second loop is configured Programmer options only available if the controller is a programmer/controller
Init LgcIO LA	Min OnTime This applies to both LA and LB inputs	**Auto** 0.01 to 150.00	[Note 2] [Note 3]
The above two parameters are repeated for the LB Logic I/O (LgcIO LB)			
Init RlyOP AA	Relay function This relay is always fitted.	**Not Used,** Lp1 Ch1, Lp1 Ch2, Lp2 Ch1, Lp2 Ch2, Alarm 1 to 8, Any Alarm, New Alarm, ProgEvnt1 to 8, LP1SBrkOP, LP2SBrkOP*, LPsSBrk*.	Always. [Note 4] Programmer options only available if the controller is a programmer/controller)
Init RlyOP AA	Min On Time	**Auto** 0.01 to 150.00	[Note 2] [Note 3]

Note 1) Parameters only appear if the function has been turned on, eg If 'Control Channel 1' = 'Off', 'Chan 1' does not appear in this list. When a control channel is configured for valve positioning, LgcIO LA and LgcIO LB act as a complementary pair. If, for example, Chan 1 is connected to LgcIO LA (valve raise) then LgcIO LB is automatically set to Chan 1 (valve lower). This ensures the valve is never raised and lowered simultaneously.

The same complementary behaviour also applies to dual output modules and channels A and C of triple output modules

Note 2) If any input function, for example Chan 1, is connected to another input it will not appear in this list

Note 3) Is available if the Control Channel is not On/Off and is allocated to the LA, LB or AA output as applicable

Note 4) For valve position control Chan 1 or Chan 2 will not appear in this list. Valve position outputs can only be dual outputs such as LA and LB or dual relay/triac output modules

2.1.2.1 Modules

The following parameters configure the plug in I/O modules. I/O Modules can be fitted in any available slot in the instrument (6 slots in 3504, 3 slots in 3508). The controller automatically displays parameters applicable to the module fitted - if no module is fitted in a slot then it does not appear in the list.

Each module can have up to three inputs or outputs. These are shown as A, B or C after the module number and this corresponds to the terminal numbers on the back of the instrument. If the I/O is single only A appears. If it is dual A and C appears if it is triple A, B and C appear.

Note 1: If a Dual DC Output module is fitted, it cannot be configured using the Quick Start Code. To configure this module refer to the Engineering Manual part no. HA027988 which can be downloaded from www.eurotherm.co.uk.

Note 2: If an incorrect module is fitted the message 'Bad Ident' will be displayed.

Module type	Parameter	Value	Availability
Change over relay (R4) 2 pin relay (R2) Triac output (T2)	Relay (Triac) function	Not Used All parameters the same as RlyOP AA, including Min OnTime if the OP is a relay	Always (if the module is fitted)
Dual Relay (RR)	Relay (Triac) function		
Dual triac output (TT)	Relay function		
Single Logic Output (LO)	Logic Out function	Not Used All parameters the same as RlyOP AA	Always (if the module is fitted)
Triple Logic Output (TP)			

Module type	Parameter	Value		Availability
DC Output (D4) DC Retransmission (D6)	DC Output function	Not Used LP1 Ch1OP LP1 Ch2OP LP2 Ch1OP LP2 Ch2OP LP1 SP Tx LP1 PV Tx LP1 ErrTx LP1 PwrTx LP2 SP Tx LP2 PV Tx LP2 ErrTx LP2 PwrTx	Module fitted but not configured Loop 1 Channel 1 control output Loop 1 Channel 2 control output Loop 2 Channel 1 control output Loop 2 Channel 2 control output Loop 1 setpoint retransmission Loop 1 PV retransmission Loop 1 error retransmission Loop 1 output retransmission Loop 2 setpoint retransmission Loop 2 PV retransmission Loop 2 error retransmission Loop 2 output retransmission	Always (if the module is fitted)
	Range Type	0–5V, 1-5V, 1–10V, 2–10V, 0-29mA, 4-20mA		
	Display High	100.0		
	Display Low	0		
Triple Logic Input (TL) Triple Contact Input (TK)	Logic In function	Not Used LP1 A-M LP1 SPsel LP1 AltSP LP2 A-M LP2 SPsel LP2 AltSP AlarmAck ProgRun ProgReset ProgHold	Module fitted but not configured Loop 1 Auto/manual Loop 1 SP select Loop 1 Alternative SP select Loop 2 Auto/manual Loop 2 SP select Loop 2 Alternative SP select Alarm acknowledge Programmer run Programmer reset Programmer hold	A function can only be allocated to one input. eg if AlarmAck is configured on X*A it is not offered for the other inputs * is the module number. LP2 does not appear if loop 2 is not configured.

Module type	Parameter	Value		Availability
Analogue Input (AM)	Analogue IP function	Not Used	Module fitted but not configured	LP1 V1Pos and LP1 V2Pos only appear if the control channel 1 or control channel 2 is set to VPB. Remote SP does not appear if the programmer option is supplied. LP2 does not appear if loop 2 is not configured.
		LP1 AltSP	Loop 1 alternative setpoint	
		LP1 OPH	Loop 1 remote OP power max	
		LP1 OPL	Loop 1 remote OP power min	
		LP2 AltSP	Loop 2 alternative setpoint	
		LP2 OPH	Loop 2 remote OP power max	
		LP2 OPL	Loop 2 remote OP power min	
		LP1 V1Pos LP1 V2Pos	To read valve position from the feedback potentiometer loop 1	
		LP2 V1Pos LP2 V2Pos	To read valve position from the feedback potentiometer loop 2	
	Range Type	Thermocouple: J, K, L, R, B, N, T, S, PL2, C. RTD: Pt100 Linear: 0-50mV, 0-5V, 1-5V, 0-10V, 2-10V, 0-20mA, 4-20mA		Not shown if analogue IP function not used
	Display High	100.0		These parameters only appear for Linear Range
	Display Low	0.0		

Module type	Parameter	Value		Availability
Potentiometer Input (VU)	Pot Input function	Not Used	Module fitted but not configured	Ch1VlvPos/Ch2VlvPos only appear if the channel = VPB Remote SP does not appear if the programmer option is supplied. LP2 does not appear if loop 2 is not configured.
		LP1 AltSP	Loop 1 Alternative setpoint	
		LP1 OPH	Loop 1 output power maximum	
		LP1 OPL	Loop 1 output power minimum	
		LP2 AltSP	Loop 2 Alternative setpoint	
		LP2 OPH	Loop 2 output power maximum	
		LP2 OPL	Loop 2 output power minimum	
		LP1 V1Pos	To read valve position from the feedback potentiometer loop 1	
		LP1 V2Pos		
		LP2 V1Pos	To read valve position from the feedback potentiometer loop 2	
		LP2 V2Pos		
Transducer Power Supply (G3)	TdcrPSU function	5 Volts 10 Volts		Always (if the module is fitted)
Transmitter power supply (MS)	No parameters. Used to show the ID of the module if fitted			

2.1.2.2 Alarms

Group	Parameter	Value		Availability
Init Alarm 1 to 8	Type	None Abs High Abs Low Dev High Dev Low Dev Band	No alarm type configured Absolute high Absolute low Deviation high Deviation low Deviation band	Always
Init Alarm 1 to 8	Source	**None** PV Input LP1 PV LP2 PV Module1 to Module6	Not connected Connected to current process variable does not appear if Alarm Type = Deviation Connected to Loop 1 process variable Connected to Loop 2 process variable Connected to an analogue input module and only of the Alarm Type is not a deviation alarm	Always if Type ≠ None PV Input and ModX Ip do not appear if Type = Deviation
Init Alarm 1 to 8	Setpoint	To adjust the alarm threshold within the range of the source.		Always if Type ≠ None
Init Alarm 1 to 8	Latch	**None** Auto Manual Event	No latching Automatic latching see section 2.7.1 Manual latching see section 2.7.1 Alarm beacon does not light but any output associated with the event will activate and a scrolling message will appear.	Always if Type ≠ None
Finished	Exit	**No** Yes	Continue back around the quick configuration list Go to normal operation. The loop(s) are set to Auto on exit from quickstart mode and the controller re-starts in Level 2.	

2.2 To Re-enter Quick Start Mode

If you have exited from Quick Start mode (by selecting 'Yes' to the 'Finished' parameter) and you need to make further changes, the Quick start mode can be entered again at any time. The action which takes place depends on one of two previous conditions as follows:-

2.2.1 Power up After a Quick Start Configuration

1. Hold ⊜ down then power up the controller. Keep this button pressed until the Quick start screen as shown in section 2.1 is displayed.
2. Press ⊙ to enter the quick start list. You will then be asked to enter a passcode.
3. Use ⊛ or ⊜ to enter the passcode – default 4 – the same as the configuration level passcode. If an incorrect code is entered the display reverts to the 'Quick Start' view section 2.1.

It is then possible to repeat the quick configuration as described previously.
The Quick Start view shown in section 2.1 now contains an additional parameter - **'Cancel'**. This is now always available after a power up, and, if selected, will take you into normal operating mode, section 2.3.

2.2.2 Power up After A Full Configuration

Repeat 1,2 and 3 above.

Full configuration allows a greater number of parameters to be configured in a deeper level of access. This is described in the Engineering Handbook Part No. HA027988.

If the controller has been re-configured in this level, a **'WARNING'** message, **'Delete config?'** - **'No'** or **'Yes'**, will be displayed. If 'No' is selected the display drops back to the 'GoTo' screen.

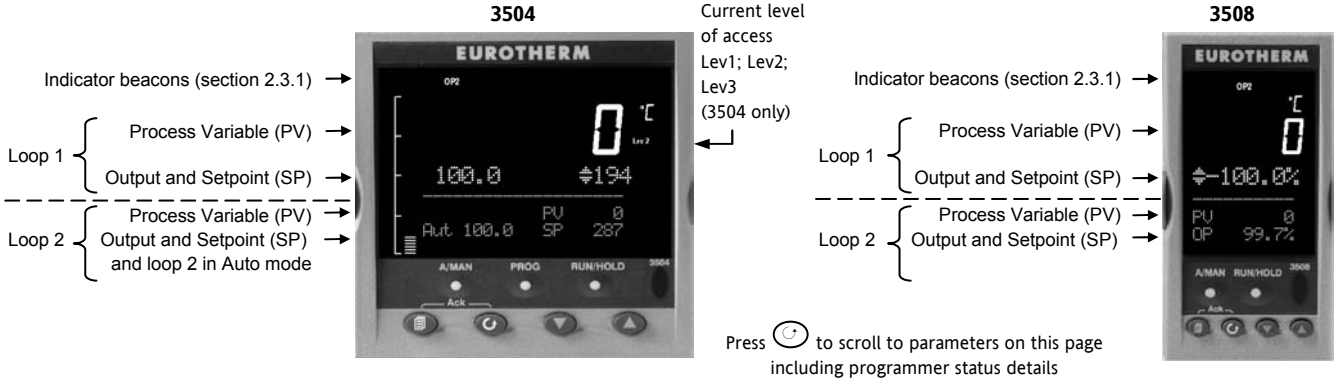
1. Use ⊛ or ⊜ to select 'Yes'
2. Press ⊙ to confirm or ⊜ to cancel. (If no button is pressed for about 10 seconds the display returns to the WARNING message).

If 'Yes' is selected the **Quick start defaults** will be re-instated. A**ll** the Quick start parameters must be reset.

2.3 Normal Operation

Switch on the controller. Following a brief self-test sequence, the controller will start up in AUTO mode (see AUTO/MAN section 2.6) and Operator Level 2 (following Quick Start).

If the controller is configured as a dual loop instrument the start up view shows a summary of the two loops. This is called the HOME display.



If the controller is configured as a single loop the HOME displays will vary as shown below:-

Loop 1 configured

Loop 2 configured

Other views may be configured as the HOME display and other summary displays can be selected using button. See Message Centre section 2.8.

2.3.1 Beacon Display and Description

Beacon	Description
OP1	Illuminates when output 1 is ON (normally heating)
OP2	Illuminates when output 2 is ON (normally cooling or alarm)
MAN	Illuminates when manual mode active. If the HOME display is showing the dual loop overview, MAN illuminates if Loop 1 is in manual. If the Loop 1 or Loop 2 overviews are being displayed MAN applies to the loop being displayed.
REM	Illuminates when remote setpoint active
SPX	Illuminates when alternative setpoint active
ALM	If an alarm occurs the red alarm beacon flashes. This is accompanied by a message showing the source of the alarm, for example 'Boiler overheating'. To acknowledge press and . The message disappears. If the alarm condition is still present the beacon lights continuously. When cleared it will extinguish. A full description of the alarm operation is given in section 2.7
RUN	Illuminates when programmer running – flashing indicates End
HLD	Illuminates when programmer held
J	Flashes when J Channel comms active
H	Flashes when H Channel comms active
IR	Flashes when infra red communications active

In general throughout this handbook instrument views will use the 3504. The displayed information is similar for the 3508 but in some cases is shortened due to display limitations.

2.4 The Operator Buttons

Page Scroll Lower Raise

A/MAN This button can be disabled	Toggles the selected loop between Auto and Manual operation. The action of this button is described in section 2.6. Manual operation means that the controller output power is adjusted by the user. The input sensor is still connected and reading the PV but the control loop is open. Auto means that the controller is automatically adjusting the output to maintain control, ie the loop is closed. If the controller is in manual mode, 'MAN' light will be indicated. If the controller is powered down in Manual operation it will resume this mode when it is powered up again.
PROG	To select the programmer summary page
RUN/HOLD This button can be disabled	Press once to start a program. 'RUN' will be indicated Press again to hold a program. 'HLD' will be indicated Press and hold for at least two seconds to reset a program. 'RUN' will flash at the end of a program 'HLD' will flash during holdback Programmer operation is fully described in chapter 21 of the Engineering Manual
⊜	Press to select new PAGE headings
↻	Press to select a new parameter in the page
▼	Press to decrease an analogue value, or to change the state of a digital value
▲	Press to increase an analogue value, or to change the state of a digital value

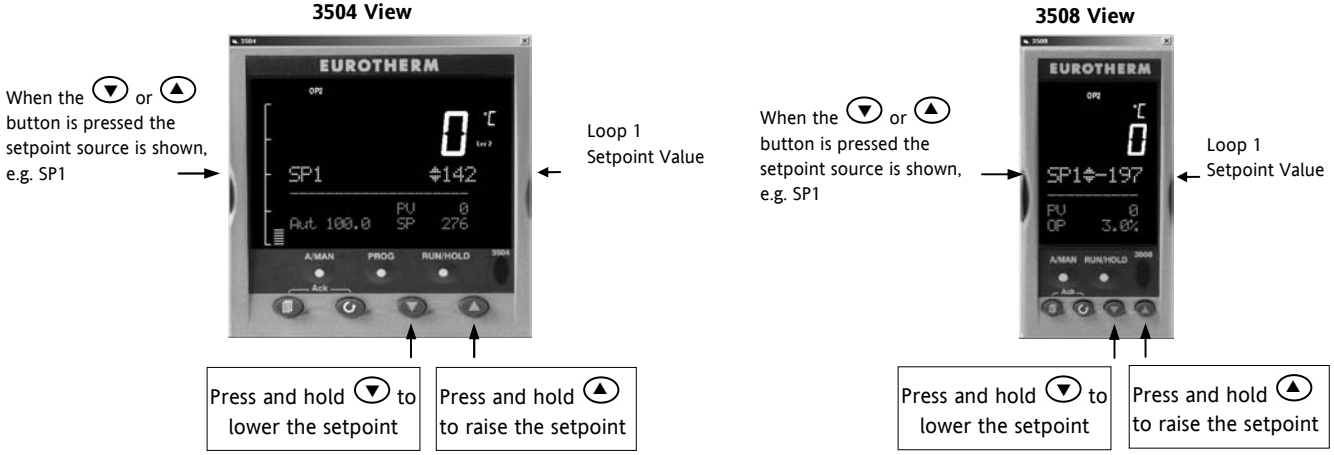
2.4.1 Shortcut Key Presses

The following Short Cut Key presses are provided:-

Action	Key Presses
Backpage	Press (page) followed by (▲). With (page) held down continue to press (▲) to scroll page headers backwards. (With (page) still pressed you can press (▼) to page forward. This action is the same as pressing (page) alone).
Backscroll	When in a list of parameters, press (↻) followed by (▲). With (↻) held down continue to press (▲) to scroll parameters backwards. (With (↻) still pressed you can press (▼) to page forward. This action is the same as pressing (↻) alone).
Jump to HOME display	Press (page) + (↻)
Alarm Ack/reset	Press (page) + (↻) when the HOME screen is being displayed to jump to the 'Acknowledge All alarms' page. Pressing (↻) acknowledges all alarms if it can, see section 2.7.1. Pressing (page) cancels the operation.

2.5 To Set The Required Temperature (Setpoint)

A parameter value can be changed if it is preceded by ⬍. In the example shown below this is the setpoint for loop 1.
To change the value, press ▼ or ▲. The output level shown in the HOME display will change to indicate the source of the setpoint while either of the buttons is pressed, in this example SP 1.



To change Loop 2 setpoint, press ↻. Loop 2 SP value is preceded by ⬍. Press ▼ or ▲ as above to change the value. The action is then the same as for loop 1. A momentary press of either button will show the setpoint in use eg SP1.

The new setpoint is accepted when either ▼ or ▲ is released and is indicated by a brief flash of the setpoint display

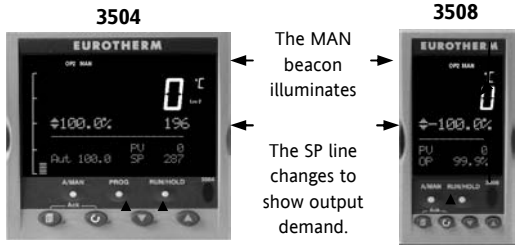
If a single loop is configured (or the individual loop summary is selected – see section 2.8.1) pressing ▼ or ▲ will change the setpoint in the same way as described above.

2.6 To Select Manual Operation

Press (A/MAN) button.

If two loops are enabled and the dual loop overview is being displayed, pressing the A/MAN button will toggle loop 1 between Auto and Manual. The beacon 'MAN' will light and the indication of output power is preceded by ⇕.

Press and hold ⊙ or ⊙ to decrease or increase the output power.



The output power will change continuously while either ⊙ or ⊙ is pressed

To switch loop 2 between Auto and Manual, press ⊙ to scroll into the loop 2 section, then press A/MAN.

If loop 1 overview is being displayed, press the A/MAN button to toggle loop 1 between Auto and Manual.
If loop 2 overview is being displayed, press the A/MAN button to toggle loop 2 between Auto and Manual.
If any other overview is being displayed, the first press of the A/MAN button will select the dual loop overview and the action is as described above.

☺ Summary pages may be disabled in configuration level. If none of the above summary pages are enabled:-

- For a dual loop controller, Auto/Manual cannot be selected.
- If loop 1 is enabled and loop 2 disabled, pressing A/MAN toggles Auto/Manual for loop 1.
- If loop 2 is enabled and loop 1 disabled, pressing A/MAN toggles Auto/Manual for loop 2.

☺ For a single loop controller, Auto/Manual will apply regardless of whether summary pages are enabled or not.

☺ If the controller is switched off in either Auto or Manual operation it will resume the same mode when powered up again.

2.7 Alarm Indication

If an alarm occurs it is indicated as follows:-

The red alarm (ALM) beacon in the top left of the display flashes

Alarm number is indicated together with the flashing

A default or pre-programmed message appears showing the source of the alarm

Invitation to acknowledge the new alarm

2.7.1 To Acknowledge an Alarm **Press and** (Ack) **together.**

The action, which now takes place, will depend on the type of latching, which has been configured

Non Latched Alarms

If the alarm condition is present when the alarm is acknowledged, the alarm beacon will be continuously lit. This state will continue for as long as the alarm condition remains. When the alarm condition disappears the indication will also disappear.

If a relay has been attached to the alarm output, it will de-energise when the alarm condition occurs and remain in this condition until the alarm is acknowledged **AND** it is no longer present.

If the alarm condition disappears before it is acknowledged the alarm indication disappears as soon as the condition disappears.

Automatic Latched Alarms

The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can occur **BEFORE** the condition causing the alarm is removed.

Manual Latched Alarms

The alarm continues to be active until both the alarm condition is removed AND the alarm is acknowledged. The acknowledgement can only occur **AFTER** the condition causing the alarm is removed.

2.7.2 Sensor Break Indication

An alarm condition (5.br) is indicated if the sensor or the wiring between sensor and controller becomes open circuit or the input is over-range. The message 'Sbreak' is shown in the message centre together with the source of the sensor connection. This may be 'PVInupt' or 'Modx' if an analogue module is fitted.

For a resistance thermometer input, sensor break is indicated if any one of the three wires is broken.

For mA input sensor break will not be detected due to the load resistor connected across the input terminals.

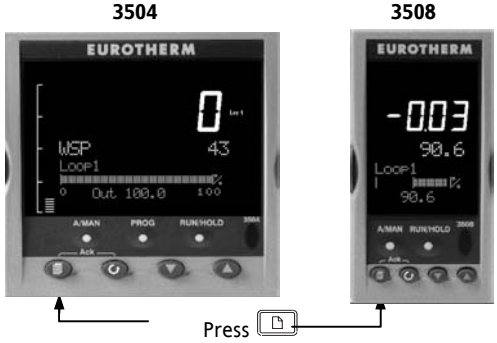
For Volts input sensor break may not be detected due to the potential divider network connected across the input terminals.

2.8 Message Centre

The lower section of the HOME display contains an alpha-numeric set of messages. These messages change between different controller types and operating modes and are grouped in summary pages. The 3504 contains more information than the 3508, and generally the parameter descriptions are longer due to the larger display..

2.8.1 Summary Pages

Press . A set of pre-defined summary pages are shown at each press - the following views show examples. These are typically a summary of programmer, loops and alarm operation. A further eight customised pages can be programmed off line using iTools programming software. The level in which the Summary Pages are shown may also be defined using iTools.



At each press a new display will be shown

2.8.1.1 Loop Summary

If two loops are configured the display shown in section 2.3 is shown.

Press to display a summary for Loop1 and again for Loop 2.

The horizontal bar graph shows output power demand for the loop. For **heat/cool** the bar graph is bi-directional (± 100%) as shown:-

For **valve position** control the user interface will display either heat only or heat/cool summary pages.

A timeout to the dual loop overview may be changed in configuration level, see Engineering Handbook, Part No HA027988 which can be downloaded from www.eurotherm.co.uk..

2.8.1.2 Program Status

This display is only shown if the Programmer option has been enabled

	3504	3508
SyncAll and single programmers →		
SyncStart programmer →		

2.8.1.3 Program Edit

Allows the program to be created or edited.

SyncAll and single programmers →		
SyncStart programmer →		

A full list of parameters is given in section 2.8.3.

Note:- For a SyncStart programmer it is possible to select between Channel 1 and Channel 2.

2.8.1.4 Alarm Summary

Press ⟳ to scroll through the alarms.

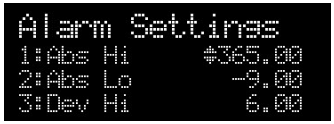
A New Alarm occurs when any new alarm becomes active. This parameter may be used to activate a relay output to provide external audible or visual indication.

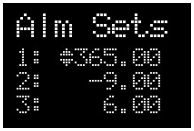
2.8.1.5 Alarm Settings

All configured alarms (up to eight) will be listed.

Press ⟳ to scroll through the alarms.

Press ▲ or ▼ to set the threshold values





2.8.1.6 Control

To set parameters which define the operation of the loops. A full list of parameters is given in section 2.8.4.

2.8.1.7 Transducer

This display is only shown if the Transducer option has been enabled.

For further details see the 3500 Engineering Manual HA027988.

Further customised pages may be available if they have been configured.

2.8.2 How to Edit Parameters

In the above summary pages, press ⟳ to scroll to further parameters (where applicable).

Press ▼ or ▲ to change the value of the parameter selected.

Any parameter preceded by ⬍ is alterable provided the system is in a safe state to allow the parameter to be changed. For example, 'Program Number' cannot be changed if the program is running - it must be in 'Reset' or 'Hold' mode. If an attempt is made to alter the parameter its value is momentarily replaced by '---' and no value is entered.

Some parameters are protected under a higher level of security – Level 2. In these cases it will be necessary to select 'Access Level 2'. This is carried out as follows:-

1. Press and hold ☰ until the display shows

2. Press ▲ to select Level 2
3. Press ▲ again to enter a security code. This is defaulted to 2. If an incorrect code is entered the display reverts to that shown in 1 above. If the default of 2 is not accepted this means that the code has been changed on your particular controller. It will be necessary to refer to the Engineering Handbook.
4. 'Pass' is displayed momentarily. You are now in Level 2.

2.8.3 Program Status Page

Provided it has been ordered and enabled the 3500 series controllers can program the rate of change of setpoint. Two program channels are available which can be run as two separate programmers or as a pair. Up to 50 programs and up to a maximum of 500 segments can be stored and run. Setpoint programming is explained in more detail in the 3500 Engineering Manual HA027988.

2.8.3.1 To Select a Parameter

Press ⟳ to scroll through a list of parameters. On the 'Programmer Summary' shown here, the list of parameters which can be selected are:-

Parameter Name	Parameter Description	Value		Default	Available in Level
Program	Program number (and name if this has been configured)	1 to max number of programs		1	L1 Alterable when prog in reset
Segment	Segment number (and type on 3504) Only appears when the programmer is running	1 to max number of segments		1	L1
Seg Time Left	Segment Time Left Only appears when the programmer is running	hrs:mins:secs		Read only	L1
Delayed Start	Program will run after a set time has elapsed	0:00 to 499:99		0:00	L1 if configured
Status	Program Status	End Run Hold Holdback	Prog ended Prog running Prog held In holdback (1)		L1

Parameter Name	Parameter Description	Value	Default	Available in Level
Ch1 PSP (or PSP)	Profile setpoint value channel 1	Can be changed in Hold		L1
Ch2 PSP	Profile setpoint value channel 2	Can be changed in Hold		L1
Fast Run	This allows the program to be run at a fast rate and may be used for testing the program. It can only be selected before the program is run.	No/Yes	No	
Rst UsrVal	User value to be used in reset state. Defines the value for 'UsrValOP'. In segments that specify 'PVEvent', 'UsrValOP' is set to this value Only appears when the program is in reset mode.			
Ch1 Seg Target (or Segment Target)	Requested setpoint at end of segment			
Ch2 Seg Target				
Seg. Duration (or Segment Rate)	Segment time – Time to Target programmer Rate of change of SP – Ramp Rate programmer			
Cur. Seg Type	Single programmer only			
Cycles Left	Number of repeat cycles left to run Can only be changed in Hold or Reset	1 to maximum number of cycles set		L1 R/O in Run
Events or Rst Events	State of the event outputs when the program is running or when in reset	☐ Event inactive ■ Event active		L1
PrgTimeLeft	Time remaining to end of selected program	hrs:mins:secs		L1
GoBackCyclesLeft	The number of cycles left if Go Back is configured and active	1 to maximum number of cycles set		

Note 1:- Holdback

Holdback freezes the program if the process value (PV) does not track the setpoint (SP) by more than a user defined amount. The instrument will remain in HOLDBACK until the PV returns to within the requested deviation from setpoint. The display will flash the HOLD beacon.

In a **Ramp** it indicates that the PV is lagging the SP by more than the set amount and that the program is waiting for the process to catch up.

In a **Dwell** it freezes the dwell time if the difference between the SP and PV exceeds the set limits.

In both cases it maintains the correct soak period for the product. A more detailed description of Holdback is given in the 3500 Engineering Handbook which may be downloaded from www.eurotherm.co.uk.

In addition to the usual PV Holdback, Holdback is also the state when synchronisation is taking place.

- For a SyncAll programmer, this occurs if Holdback has caused one PSP to be held back while the other has progressed to completion.
- For a SyncStart programmer, this occurs when Ch1/2 is waiting for the other channel.
- In both models, it occurs when a Wait segment has been configured and is active. When one channel has reached the end of the first cycle and is waiting fro the other channel to complete its first cycle. Both channels will start cycle 2 only when they have both completed. (Implied Sync point at the end of each cycle).

2.8.3.2 To Select and Run a Program

In this example it is assumed that the program to be run has already been entered. Setpoint programming is described in detail in Chapter 22 of the Engineering Handbook.

Do This	The Display You Should See	Additional Notes
1. Press RUN/HOLD 2. Press ▲ or ▼ to choose the program number to be run		In this example Program Number 1. It may also have a user defined name. In the 3504 Program names can be entered using the off-line programming package 'iTools'
3. Press RUN/HOLD again		If a delayed start has been configured the program will start to run after the delay period set.. The 'RUN' beacon is illuminated at the top of the display. The view shown here shows program being run, segment number and type and time left to complete this segment.
4. Repeated pressing of ⟳ will scroll through parameters associated with the running program. The parameters are listed in the above table		These show current value of channel 1 setpoint and current value of channel 2 setpoint. The target value of channel 1 is also shown.
5. To Hold a program press RUN/HOLD		Press RUN/HOLD again to continue the program. When the program is complete 'RUN' will flash
6. To Reset a program press and hold RUN/HOLD for at least 3 seconds		'RUN' will extinguish and the controller will return to the HOME display shown in section 2.3.

Alternatively, run, hold or reset a program by scrolling to 'Program Status' using ⟳ and select 'Run', 'Hold' or 'Reset' using ▲ or ▼.

The PROG button (3504 only) provides a short cut to the Program Status page from any view.

2.8.3.3 Program Edit Page

A program can be edited in any level. A summary of the Edit Page is given here but for a full description refer to Chapter 22 in the Engineering Manual HA027988. A program may be only edited when it is in Reset or Hold. Press ⓘ until the Program Edit page is shown. Then press ⟳ to scroll through a list of parameters shown in the following table – parameters only appear in this table if the relevant option has been configured:-

Para Name	Parameter Description	Value	
Program	Program number (and name if this has been configured)	1 to max number of programs	
Segments Used	Displays the number of segments in the program. This value automatically increments each time a new segment is added	1 to max number of segments	
Cycles	Number of times the whole program repeats	Cont 1 to 999	Continuous Repeats 1 to 999 times
Segment	To select the segment number	1 to 50	
Segment Type	Defines the type of segment. The type of segment varies depending on whether the program is Single, SyncAll or SyncStart. Call only available in single programmer Rate, Dwell, Step not available in SyncAll programmer	Rate Time Dwell Step Wait GoBack Call End	Rate of change of SP Time to target Soak at constant SP Step change to new SP Wait for condition Repeat previous segs Insert new program Final segment
Target SP	Value of SP required at the end of the segment	Range of controller	
Ramp Rate	Rate of change of SP	Units/sec, min or hour	
Holdback Type	Deviation between SP and PV at which the program is put into a hold condition to wait for the PV to catch up. Only appears if configured	Off Low High Band	No holdback PV<SP PV>SP PV<>SP

Para Name	Parameter Description	Value	
PV Event	To set the analogue PV event in the selected segment. If PV Event ≠ None it is followed by 'PV Threshold' which sets the level at which the event becomes active. Only appears if configured	None Abs Hi Abs Lo Dev Hi Dev Lo Dev Band	No PV Event Absolute high Absolute low Deviation high Deviation low Deviation band
Time Event	To allow an On Time and an Off Time to be set in the first program event output. If set to 'Event1' an On time parameter and an Off Time parameter follow. Only appears if configured	Off Event1	
UsrVal	Sets the value of an analogue signal which can be used in the segment. Only appears if configured. Using iTools configuration package, it is possible to give this parameter an 8 character name.	Range	
PID Set	To select the PID set most relevant to the segment. Only appears if configured	Set1, Set2, Set3	
Event Outs	Defines the state of up to eight digital outputs. 1 to 8 can be configured	□□□□□□□□ to ■■■■■■■■ or T□□□□□□□ to ■■■■■■■■ T = Time event: □ = event off; ■ = event on	
Duration	Time for a Dwell or Time segment	0:00:00 to 500.00 secs, mins or hours	
GSoak Type	Applies a guaranteed soak in a Dwell segment. If configured is followed by a G.Soak Value	Off, Low, High, Band	
End Type	Defines the action to be taken at the end of the program	Dwell SafeOP Reset	Contiue at current SP Go to a defined level Reset to start of prog

Para Name	Parameter Description	Value	
Wait For	Only appears if the segment is set as Wait. Defines the condition that the program should wait for.	PrgIn1 PrgIn2 PrgIn1n2 PrgIn1or2 PVWaitIP Ch2Sync	The first four parameters are digital values which can be wired to suitable sources Analogue wait value A Ch2 segment input
PV Wait	Only appears if 'PVWaitIP' is configured and defines the type of alarm which can be applied. If this parameter is configured it is followed by 'Wait Val' which allows the trip level to be set for the condition to become true	None Abs Hi Abs Lo Dev Hi Dev Lo Dev Band	No wait Absolute high Absolute low Deviation high Deviation low Deviation band
GoBack Seg	Only appears if the segment type is 'GoBack'. It defines the segment to return to to repeat that part of the program	1 to the number of segments defined	
GoBack Cycles	Sets the number of times the chosen section of the program is repeated	1 to 999	
Call Program	Only applies to single program and only if the segment is 'Call'. Enter the program number to be inserted in the segment	Up to 50 (current program number excluded	
Call Cycles	Defines the number of times the called program repeats	Cont 1 to 999	Continuous Once to 999 times

2.8.4 Control Summary Page

On the Control Summary page the following parameters are available:-

Para Name	Parameter Description	Value	Default	Availability
SP Select	To select SP1 or SP2	Between range limits set in higher levels of access	As order code	Lev1
SP1	To set the value of SP1			Lev1
SP2	To set the value of SP2			Lev1
SP Rate	To set the rate at which the setpoints change			Lev 1 alterable in Lev2 * Parameter does not appear if control is configured for On/Off
Tune*	To start self tuning	Off, On	Off	
PB*	To set proportional band	0 to 99999		
Ti*	To set integral time	Off to 99999		
Td*	To set derivative time	Off to 99999		
R2G*	To set relative cool gain	0.1 to 10.0		
CBH*	To set cut back high	Auto to 99999		
CBL*	To set cut back low	Auto to 99999		
Output Hi	To set a high limit on the control output	-100.0 to 100.0%	100.0	
Output Lo	To set a low limit on the control output	-100.0 to 100.0%	0.0	
Ch1 OnOff Hyst	Channel 1 hysteresis (Only if configured and for On/Off control)	0.0 to 200.0		Lev 1- alterable in Lev2
Ch2 OnOff Hyst	Channel 2 hysteresis (Only if configured and for On/Off control)	0.0 to 200.0		
Ch2 DeadB	Channel 2 deadband. To set the period in which there is no output from either channel. (This does not appear if channel 2 is not configured)	Off to 100.0		
Ch1 TravelT	Motor travel time if valve control output on channel 1	0.0 to 1000.0 sec		
Ch1 TravelT	Motor travel time if valve control output on channel 1	0.0 to 1000.0 sec		
Safe OP	To set an output level under sensor break conditions	-100.0 to 100.0%	0.0	

2.9 Introduction to Configuration using iTools

iTools is a PC based configuration package which is used to configure instruments. The controller may be connected to the PC in three ways:-

1. Using an infra red clip (IR) attached to the front fascia. Set the parameter 'IR Mode' in the 'Access' list to 'On'.

2. Using a configuration clip which plugs into the side of the controller.
NOTE:- Any Ethernet or DeviceNet module must be removed before connecting the configuration clip.

Both items are available from your supplier

3. Using a RS232, RS485 or RS422 digital communications interface connected to the H or J terminals

iTools provides:-

- Parameter Set up
- Device Operation
- Device Recipe
- Program Editing
- Configuration of User Pages
- Graphical Wiring
- Cloning

Further details are explained in the 3500 Engineering Handbook HA027988 and iTools Handbook part no HA026179. Both handbooks and iTools software can be downloaded from www.eurotherm.co.uk.

2.9.1 To Scan For Connected Instruments

With the controller connected, press

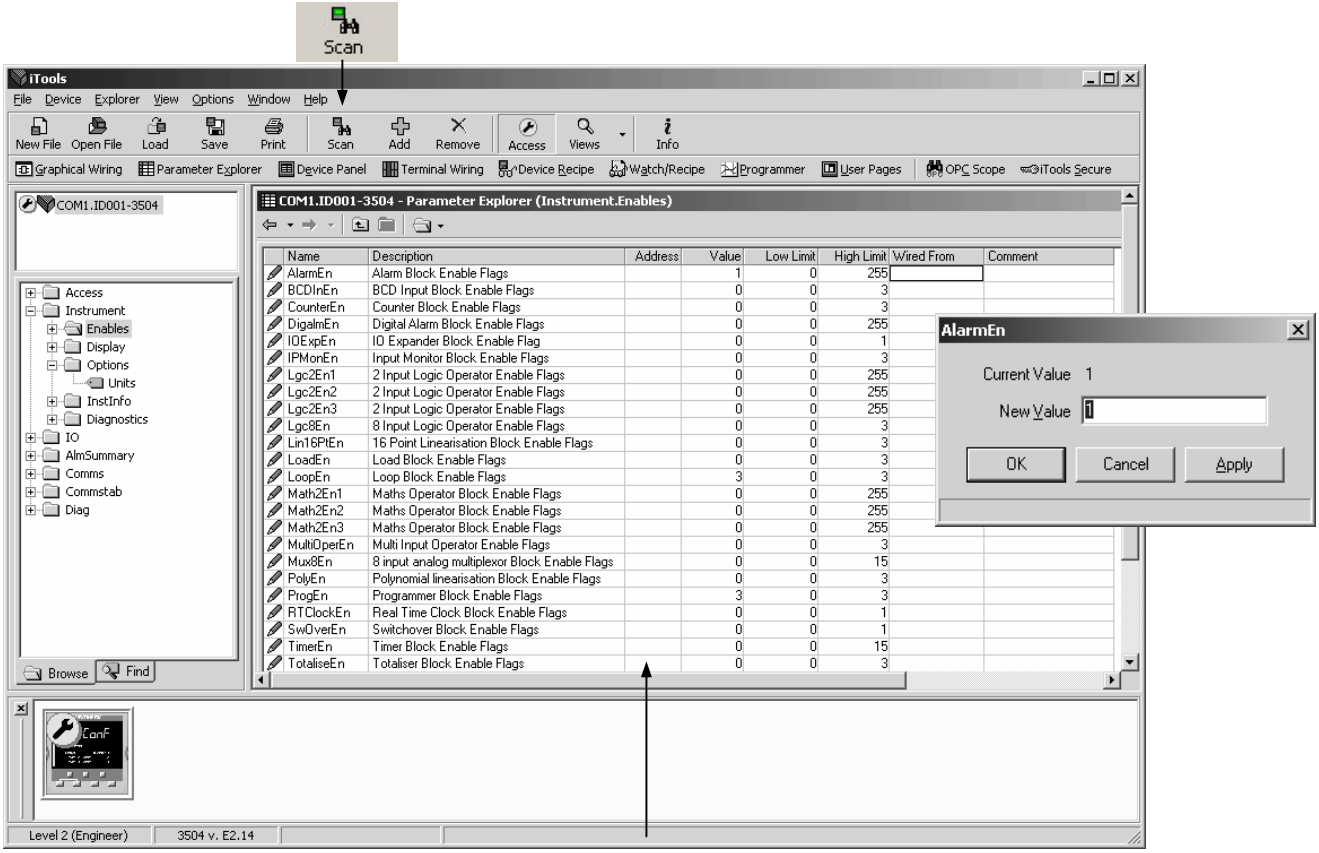
on the iTools menu bar. iTools will search the communications ports and TCPIP connections for recognisable instruments. Controllers connected with the configuration clip (CPI), will be found at address 255 regardless of the address configured in the controller.

2.9.2 Parameter Set Up

Allows parameters to be configured.

1. Press

to get this view or open up the parameter list by double clicking the required folder.
2. Right click in the parameter list to reveal or hide columns.
3. To change the value of a parameter, double click the parameter and change its value using the pop-up window
4. The 'Access' button puts the controller into configuration mode. In this mode the controller can be set up without its outputs being active. Press 'Access' again to return to operating level.
5. The instrument view is optional. Select 'Panel Views' in the 'View' menu.
6. To find a parameter select the 'Find' tab.

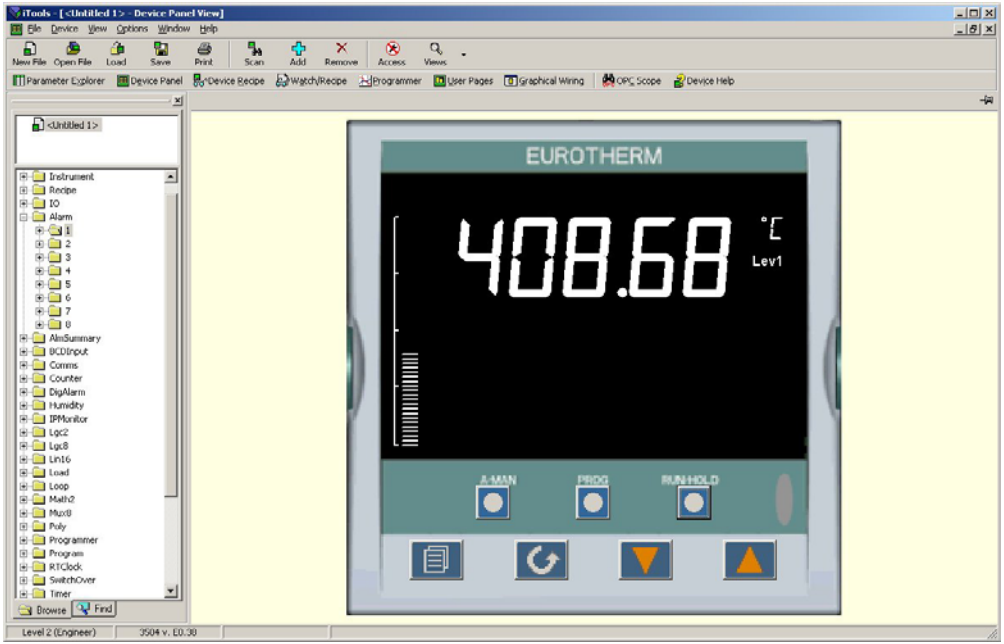

Scan
iTools
File Device Explorer View Options Window Help
New File Open File Load Save Print Scan Add Remove Access Views Info
Graphical Wiring Parameter Explorer Device Panel Terminal Wiring Device Recipe Watch/Recipe Programmer User Pages OPC Scope iTools Secure
COM1.ID001-3504
Access
Instrument
Enables
Display
Options
Units
InstInfo
Diagnostics
IO
AlmSummary
Comms
Commstab
Diag
Browse
Find
COM1.ID001-3504 - Parameter Explorer (Instrument.Enables)
Name Description Address Value Low Limit High Limit Wired From Comment
AlarmEn Alarm Block Enable Flags 1 0 255
BCDInEn BCD Input Block Enable Flags 0 0 3
CounterEn Counter Block Enable Flags 0 0 3
DigalmEn Digital Alarm Block Enable Flags 0 0 255
IOExpEn IO Expander Block Enable Flag 0 0 1
IPMonEn Input Monitor Block Enable Flags 0 0 3
Lgc2En1 2 Input Logic Operator Enable Flags 0 0 255
Lgc2En2 2 Input Logic Operator Enable Flags 0 0 255
Lgc2En3 2 Input Logic Operator Enable Flags 0 0 255
Lgc8En 8 Input Logic Operator Enable Flags 0 0 3
Lin16PtEn 16 Point Linearisation Block Enable Flags 0 0 3
LoadEn Load Block Enable Flags 0 0 3
LoopEn Loop Block Enable Flags 3 0 3
Math2En1 Maths Operator Block Enable Flags 0 0 255
Math2En2 Maths Operator Block Enable Flags 0 0 255
Math2En3 Maths Operator Block Enable Flags 0 0 255
MultiOperEn Multi Input Operator Enable Flags 0 0 3
Mux8En 8 input analog multiplexor Block Enable Flags 0 0 15
PolyEn Polynomial linearisation Block Enable Flags 0 0 3
ProgEn Programmer Block Enable Flags 3 0 3
RTClockEn Real Time Clock Block Enable Flags 0 0 1
SwOverEn Switchover Block Enable Flags 0 0 1
TimerEn Timer Block Enable Flags 0 0 15
TotaliseEn Totaliser Block Enable Flags 0 0 3
AlarmEn
Current Value 1
New Value 1
OK Cancel Apply
Conf
Level 2 (Engineer)
3504 v. E2.14

Note:- iTools now displays the fixed SCADA addresses for those parameters that are included in the SCADA table by default. For all other parameters nothing is displayed.

2.10 Device panel

Press Device Panel for this feature. The Panel displays the active instrument panel. This can be used for remote viewing, diagnostics or Training. iTools can be used OFF-LINE to configure the product. The panel view gives an indication of how the instrument will appear when the configuration is downloaded.

The front panel control buttons, shown in the Device Panel display, are active and clicking on them with the mouse will cause the display to behave as a real instrument.



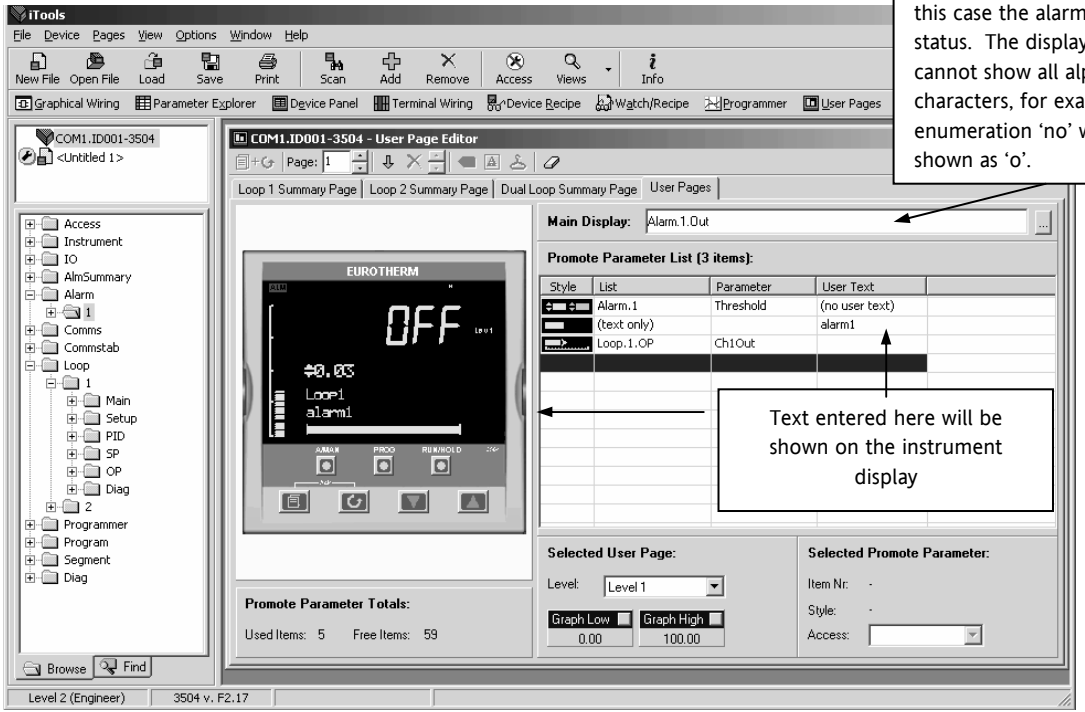
☺ Clicking on the Page button with Ctrl pressed emulates pressing the page and scroll buttons together.

2.11 User Pages Editor

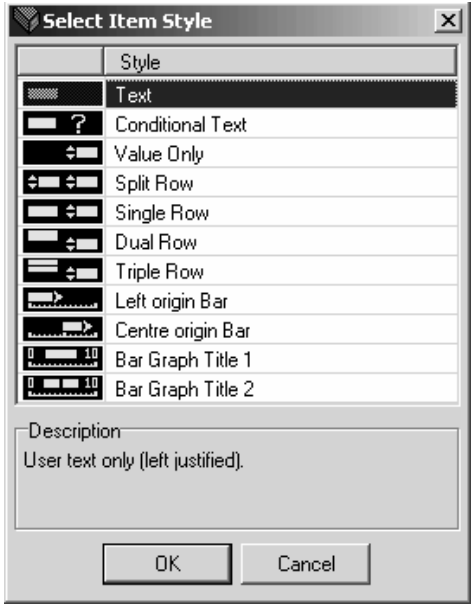
Up to 8 User Pages with a total of 64 lines can be created and downloaded into the controller so that the controller display shows only the information which is of interest to the user.

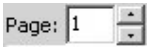
Press

to select this feature

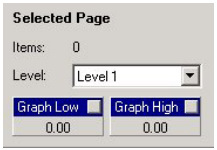


2.11.1 To create a User Page



1. Press  to select the page number 1 to 8

2. Drag and drop parameters from the browser to create the user parameter list
3. Choose the required style. The format is shown in the pop up window
4. Right click in the list to:
    a. Insert an item
    b. Remove an item
    c. Edit Wire. allows you to change the parameter selected
    d. Edit Text. Allows you to enter your own text for the parameter displayed
    e. Edit Style. This is shown in the pop up window
    f. Read Parameter Properties
    g. Open Parameter Help
5. Select the operator level at which the user page will be displayed
6. If a bar graph is displayed, set the low and high graph axes



The format of the user page is shown in the instrument view

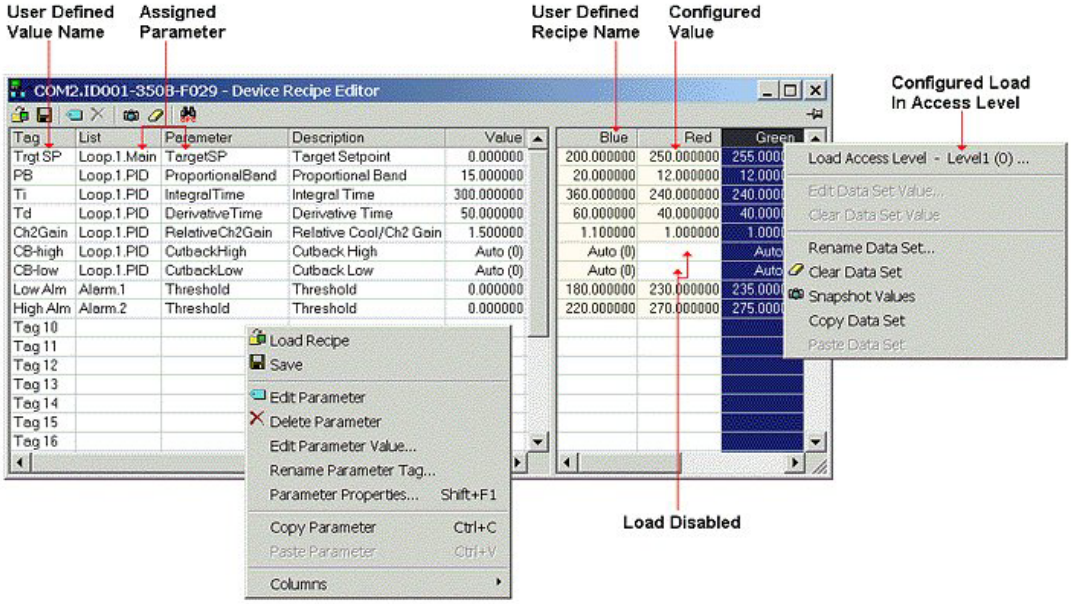
The user page can now be saved and downloaded to the instrument.

2.12 Recipe Editor in iTools

Press

for this feature. Up to 8 recipes can be stored. They can also be named by the user. Recipes allow the operator to change the operating values of up to 24 parameters in an instrument for different batch items/processes by simply selecting a particular recipe to load. Recipes are important for reducing error in setup and they remove the need for operator instructions fixed to the panel next to the instrument.

The Recipe Editor is used during configuration to assign the required parameters and to set up the values to be loaded for each recipe.



2.12.1.1 Recipe Menu Commands

Load Recipe	Used to load a recipe file into the instrument
Save	Used to save the current recipe configuration into a file
Edit Parameter	Used to assign a parameter to a Tag. Parameters can also be assigned by 'drag and drop' from the iTools parameter list
Delete Parameter	Used to delete an assigned parameter from the recipes
Edit Parameter Value	Used to edit the current value of the assigned parameter
Rename Parameter Tag	Allows the user to rename the Tag of the associated parameter. This tag is used on the instrument to identify assigned parameters (default Value1 - Value24)
Parameter Properties	Used to find the properties and help information of the selected parameter
Copy Parameter	Used to copy the currently selected parameter
Paste Parameter	Used to assign a previously copied parameter to the selected Tag
Columns	Used to hide/show the Description and Comment Columns
Load Access Level	Used to configure the lowest access level in which the selected recipe is allowed to load
Level1	Permitted to load when the instrument is in any of the access levels
Level2	Permitted to load when the instrument is in Level2, Level3 or Config access levels
Level3	Permitted to load when the instrument is in Level3 or Config access levels
Config	Permitted to load when the instrument is in the Config access level
Never	Never permitted to load

Note: Over comms, whilst the instrument is in operator mode, recipes that have been configured to load in Levels 1, 2 and 3 can be loaded. Whilst the instrument is in Config mode all recipes can be loaded.

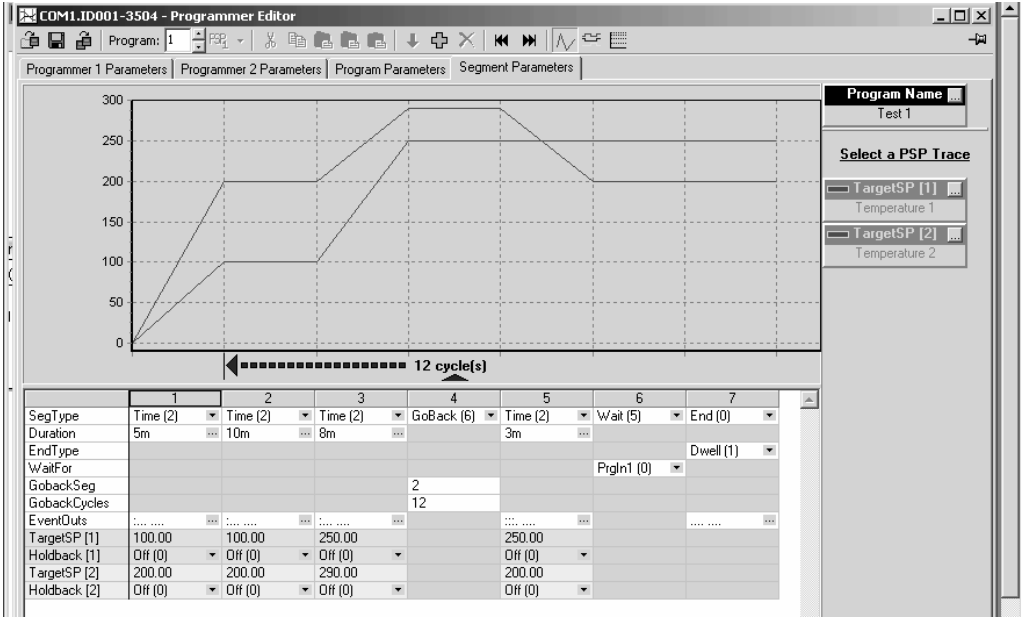
Edit Data Set Value	Used to edit the value of the selected assigned parameter within the selected recipe. Values can also be edited via double left clicking the value itself
Clear Data Set Value	Used to clear the value of the selected assigned parameter within the selected recipe, thus disabling it from loading when the recipe is selected to load
Rename Data Set	Allows the user to rename the selected recipe. This name is used to identify individual recipes (default Set1 - Set8). Note: Number of recipes dependent upon features
Clear Data Set	Used to clear all values in the selected recipe, thus disabling all from loading when the recipe is selected to load
Snapshot Values	Used to copy all of the assigned parameters current values into the selected recipe
Copy Data Set	Used to copy all values of the selected recipe
Paste Data Set	Used to paste all values of a previously copied recipe into the selected recipe

2.13 Program Editor

Setpoint programs can be created graphically, stored and downloaded into the controller. The view below is for a dual programmer.

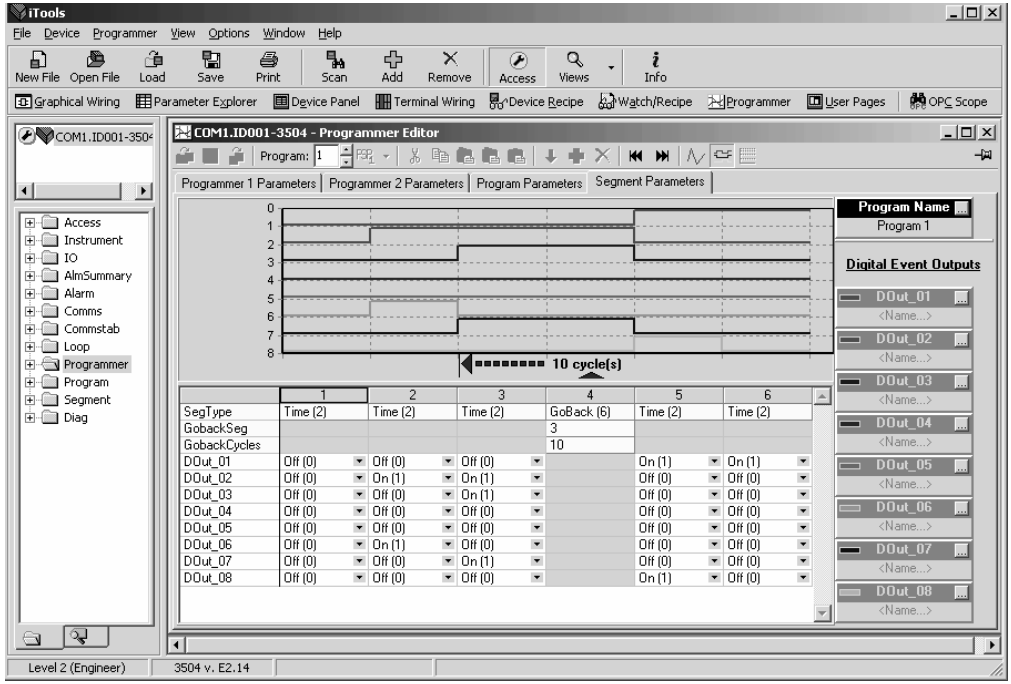
2.13.1 Analog View

1. Press Programmer to edit the analog setpoints
2. Select a program number using Program: 1
3. Double click Program Name and enter a name for the program
4. Right click in the blank area and choose 'Add Segment'
5. Select 'Segment Type' from the drop down and enter the segment details
6. Repeat for all required segments



2.13.2 Event Outputs

1. Press to select the digital events view.
2. Right click in the blank area to ‘Add Segment’
3. Use the pull downs to turn the digital event On or Off in the selected segment



2.13.3 To Copy a Program

- In the display shown above, to copy the complete program, right click in the spreadsheet section and ‘Select All’.
- Right click again in the spreadsheet section and ‘Copy’.
- Select the program number to be copied to, e.g. Program 2.
- Right click in the new section and ‘Paste All’.

2.13.4 To Copy a Segment of a Program

- Right click in the segment to be copied and select ‘Copy’.
- To add the segment at the end of the program, right click outside the segments and ‘Paste Add’
- To insert, right click in the preceeding segment and ‘Paste Insert’
- To over-write a segment, right click in the segment and ‘Paste Over’

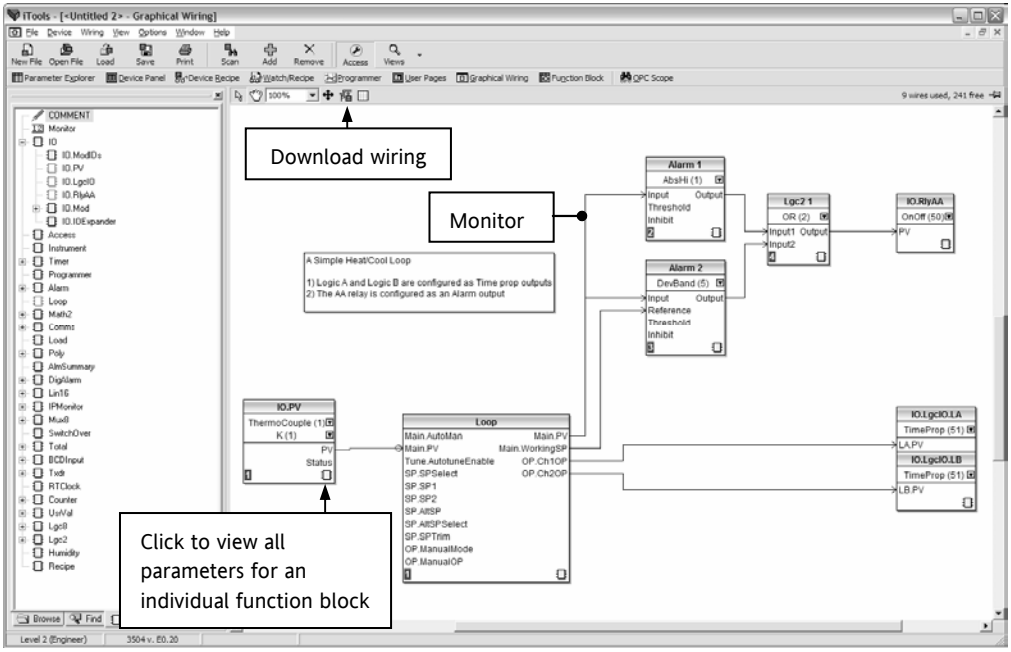
Segments will be added to the Event Outputs at the same time.

2.14 Graphical Wiring Editor

Select

(GWE) to view and edit instrument wiring. You can also add comments and monitor parameter values.

1. Drag and drop required function blocks into the graphical wiring from the list in the left pane
2. Click on parameter to be wired from and drag the wire to the parameter to be wired to (do not hold mouse button down)
3. Right click to edit parameter values
4. Add comments and notes
5. Add monitor points



2.14.1 Function Block

A Function Block is an algorithm which may be wired to and from other function blocks to make a control strategy. The Graphical Wiring Editor groups the instrument parameters into function blocks. Examples are: a control loop and a mathematical calculation.

Each function block has inputs and outputs. Any parameter may be wired from, but only parameters that are alterable may we wired to.

A function block includes any parameters that are needed to configure or operate the algorithm.

2.14.2 Wire

A wire transfers a value from one parameter to another. They are executed by the instrument once per control cycle.

Wires are made from an output of a function block to an input of a function block. It is possible to create a wiring loop, in this case there will be a single execution cycle delay at some point in the loop. This point is shown on by a || symbol and it is possible to choose where that delay will occur.

Dotted lines around a function block show that it requires downloading.

2.14.3 Using Function Blocks

If a function block is not faded in the tree then it can be dragged onto the diagram. The block can be dragged around the diagram using the mouse.

A labelled loop block is shown here. The label at the top is the name of the block.

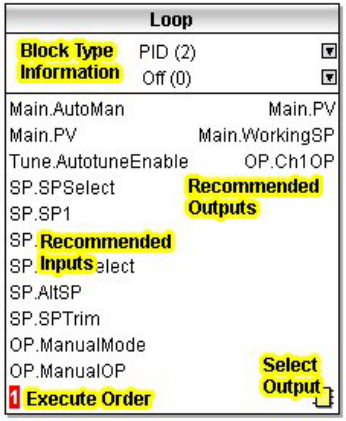
When the block type information is alterable click on the box with the arrow in it on the right to edit that value.

The inputs and outputs which are considered to be of most use are always shown. In most cases all of these will need to be wired up for the block to perform a useful task. There are exceptions to this and the loop is one of those exceptions.

If you wish to wire from a parameter which is not shown as a recommended output click on the icon in the bottom right and a full list of parameters in the block will be shown, click on one of these to start a wire.

To start a wire from a recommended output just click on it.

Click 'Select Output' to wire new parameters



2.15 User Text

User defined text can be applied to selected parameters in controllers from software versions 2.30+, and is particularly useful when used in conjunction with User Pages, see section 2.11. It is configured using iTools configuration package – it cannot be configured through the controller user interface, and is implemented in two ways:-

1. A fixed set of boolean parameters, shown in the table below, have dedicated user strings. The 'Value' of these parameters may be customised and it will then be shown as such in the enumeration of that parameter.

Function block	Default Text	Dedicated User String	iTools Browser
Two Input Logic Operators, see logic operators section 18.1 in the Engineering Manual	Off On	OutUsrTxtOff OutUsrTxtOn	Lgc2 (1 to 24)
Eight Input Logic Operators, see logic operators section 18.1.1 in the Engineering Manual	Off On	OutUsrTxtOff OutUsrTxtOn	Lgc8 (1 To 2)
Programmer Event Outputs 1 to 8, see programmer section 22.4 in the Engineering Manual	Off On	EO1UsrTxtOff to EO8UsrTxtOff EO1UsrTxtOn to EO8UsrTxtOn	Programmer (1 to 2)
Programmer PV Event Outputs 1 to 8, see programmer section 22.4.1 in the Engineering Manual	Off On	PVEOUsrTxtOff PVEOUsrTxtOfn	Programmer (1 to 2)

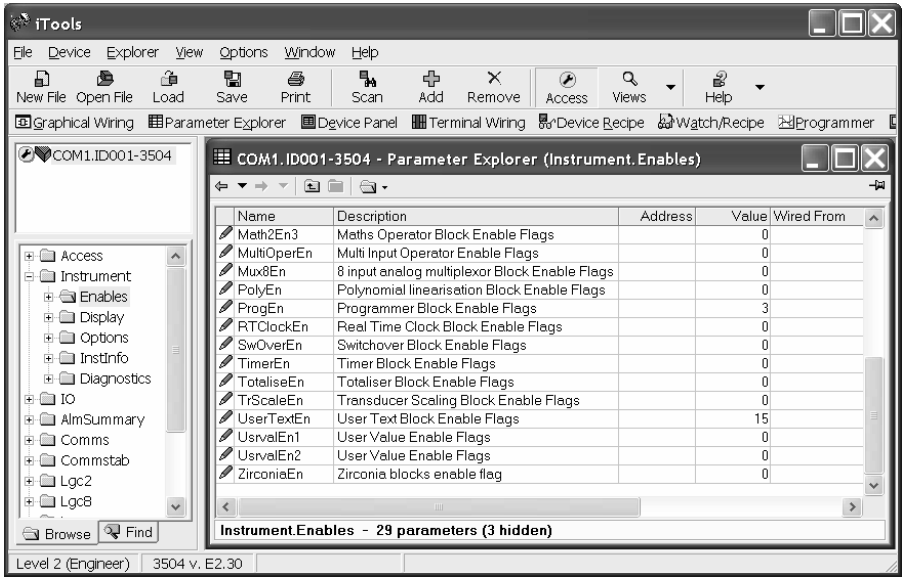
2. Eight user text blocks are available in which user defined text can be applied to both Boolean and Analogue parameters. Boolean parameters, not listed in 1 above, may be wired to Two Input Logic Operator blocks when user text blocks are in full use.

The parameter list for the User Text block is as follows:-

Parameter	Upper Limit	Lower Limit	Availability	Description
Input	32767	-32766	iTools configuration package, but can be wired through the controller	Input to be enumerated
Output	8 characters	-	iTools configuration package, or read only in the controller display but can be wired through the controller interface.	String from custom list with a value field that matches the current input
Custom list	100 characters		Comma separated list of values and strings	Configured by iTools

2.15.1 To Enable User Text

This is done in configuration level and is described in the Engineering Manual HA027988. It may also be done in iTools. The controller must be placed in configuration level by pressing


iTools
File Device Explorer View Options Window Help
New File Open File Load Save Print Scan Add Remove Access Views Help
Graphical Wiring Parameter Explorer Device Panel Terminal Wiring Device Recipe Watch/Recipe Programmer
COM1.ID001-3504
COM1.ID001-3504 - Parameter Explorer (Instrument.Enables)
Access
Instrument
Enables
Display
Options
InstInfo
Diagnostics
IO
AlmSummary
Comms
Commstab
Lgc2
Lgc8
Browse Find
Name Description Address Value Wired From
Math2En3 Maths Operator Block Enable Flags 0
MultiOperEn Multi Input Operator Enable Flags 0
Mux8En 8 input analog multiplexor Block Enable Flags 0
PolyEn Polynomial linearisation Block Enable Flags 0
ProgEn Programmer Block Enable Flags 3
RTClockEn Real Time Clock Block Enable Flags 0
SwOverEn Switchover Block Enable Flags 0
TimerEn Timer Block Enable Flags 0
TotaliseEn Totaliser Block Enable Flags 0
TrScaleEn Transducer Scaling Block Enable Flags 0
UserTextEn User Text Block Enable Flags 15
UsrvalEn1 User Value Enable Flags 0
UsrvalEn2 User Value Enable Flags 0
ZirconiaEn Zirconia blocks enable flag 0
Instrument.Enables - 29 parameters (3 hidden)
Level 2 (Engineer) 3504 v. E2.30

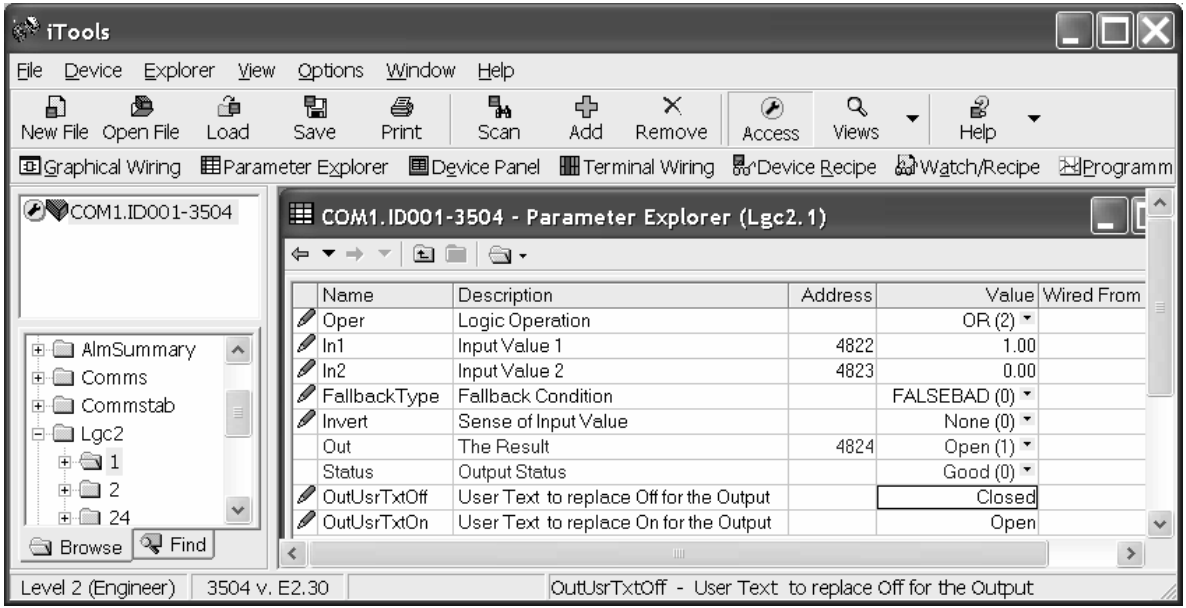
Enable block number								Value
8	7	6	5	4	3	2	1	
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
0	0	0	0	0	0	1	0	2
0	0	0	0	0	0	1	1	3
0	0	0	0	0	1	0	0	4
0	0	0	0	0	1	0	1	5
0	0	0	0	0	1	1	0	6
0	0	0	0	0	1	1	1	7
0	0	0	0	1	0	0	0	8
0	0	0	0	1	1	1	1	15
0	0	0	1	1	1	1	1	31
0	0	1	1	1	1	1	1	63
0	1	1	1	1	1	1	1	127
1	1	1	1	1	1	1	1	255

Select Instrument → Enables. Each user text block can be enabled by entering the decimal number corresponding to the bit map shown in the table. The table shows how to select any one of the first 4 blocks individually followed by all 4, 5, 6, 7 and 8 blocks.

2.15.2 Example 1: To Configure Lgc2 Operator 1

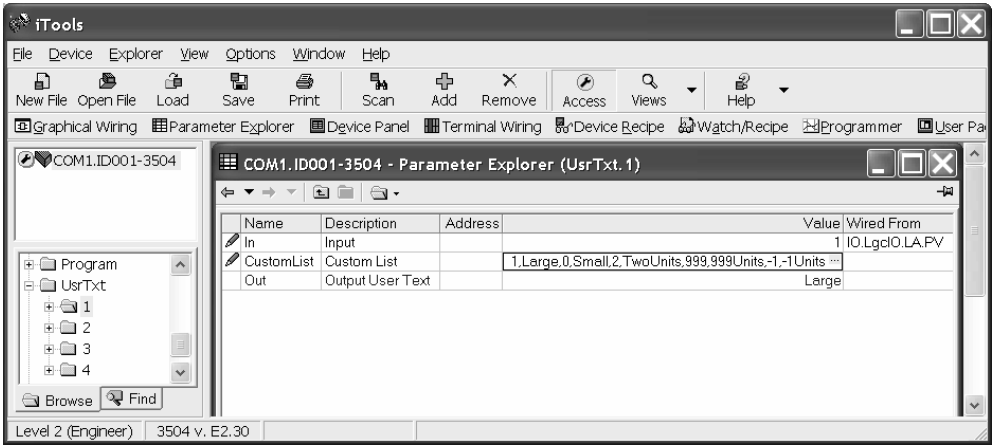
In this example when either input 1 or 2 is true (OR) the output text will read 'Open'. When neither input is true it will read 'Closed'

1. Select Lg2 → 1
2. Select either OutUsrTxtOff or OutUsrTxtOn and enter the required text in the 'Value' column

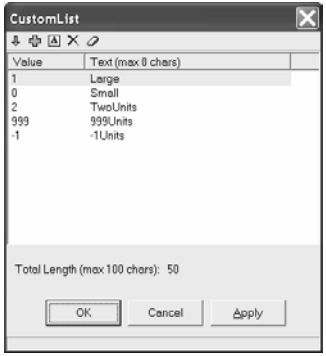

iTools
File Device Explorer View Options Window Help
New File Open File Load Save Print Scan Add Remove Access Views Help
Graphical Wiring Parameter Explorer Device Panel Terminal Wiring Device Recipe Watch/Recipe Programm
COM1.ID001-3504
AlmSummary
Comms
Commstab
Lgc2
1
2
24
Browse Find
COM1.ID001-3504 - Parameter Explorer (Lgc2.1)
Name Description Address Value Wired From
Oper Logic Operation OR (2)
In1 Input Value 1 4822 1.00
In2 Input Value 2 4823 0.00
FallbackType Fallback Condition FALSEBAD (0)
Invert Sense of Input Value None (0)
Out The Result 4824 Open (1)
Status Output Status Good (0)
OutUsrTxtOff User Text to replace Off for the Output Closed
OutUsrTxtOn User Text to replace On for the Output Open
Level 2 (Engineer)
3504 v. E2.30
OutUsrTxtOff - User Text to replace Off for the Output

2.15.3 Example 2: Configure User Text Block 1

In this example the output user text will show 'Large' or 'Small' depending on the state of a digital input (in this case the LA input). It can also be used to read 'TwoUnits', '999Units' or '-1Units' depending on the value of an analogue input i.e. 2, 999 or -1 respectively.


iTools
File Device Explorer View Options Window Help
New File Open File Load Save Print Scan Add Remove Access Views Help
Graphical Wiring Parameter Explorer Device Panel Terminal Wiring Device Recipe Watch/Recipe Programmer User Pa
COM1.ID001-3504
COM1.ID001-3504 - Parameter Explorer (UsrTxt.1)
Name Description Address Value Wired From
In Input 1 IO.LgcIO.LA.PV
CustomList Custom List 1,Large,0,Small,2,TwoUnits,999,999Units,-1,-1Units
Out Output User Text Large
Program
UsrTxt
1
2
3
4
Browse Find
Level 2 (Engineer) 3504 v. E2.30

1. Select UsrTxt → 1
2. Press the ellipsis button in 'CustomList'.
3. A pop up window is shown



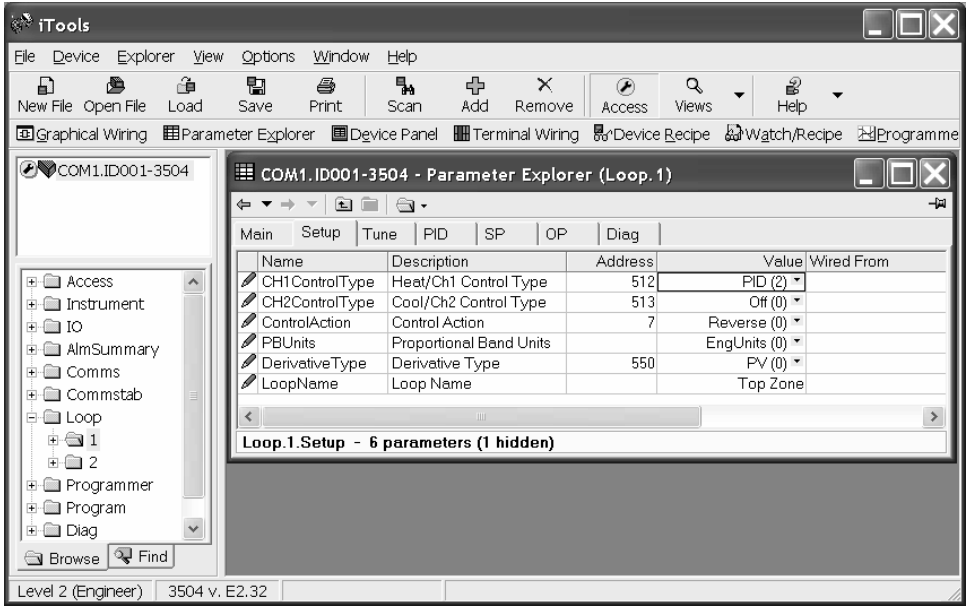
In the pop up, enter a value. 1 and 0 are used for Booleans or Analogue values. Any analogue value can be entered between 32767 and -32766. Enter text against the chosen value. In this example when the input is true 'Large' will be displayed. When false, 'Small' is displayed.

The user text can also be wired to a source parameter. In the above example the 'UsrTxt1 Input' is wired to the LA logic input. When the logic input is true (1) the user text will display 'Large'. When it is false (0) it will call up 'Small'.

These values may be promoted to a user page. Select User Pages in iTools. Use the 'Style' Value only, Split Row, Single Row, Dual Row or Triple Row.

2.16 Loop Naming

An additional parameter 'LoopName' has been added to the Loop Setup page for use controllers fitted with software versions 2.30+. This parameter is only available in iTools and will allow names to be given to each loop. The name will show on the loop summary pages only (it is not shown in the dual loop summary page since there is insuffcient space for meaningful text.


iTools
File Device Explorer View Options Window Help
New File Open File Load Save Print Scan Add Remove Access Views Help
Graphical Wiring Parameter Explorer Device Panel Terminal Wiring Device Recipe Watch/Recipe Programme
COM1.ID001-3504
COM1.ID001-3504 - Parameter Explorer (Loop.1)
Main Setup Tune PID SP OP Diag
Name Description Address Value Wired From
CH1ControlType Heat/Ch1 Control Type 512 PID (2)
CH2ControlType Cool/Ch2 Control Type 513 Off (0)
ControlAction Control Action 7 Reverse (0)
PBUnits Proportional Band Units EngUnits (0)
DerivativeType Derivative Type 550 PV (0)
LoopName Loop Name Top Zone
Loop.1.Setup - 6 parameters (1 hidden)
Access
Instrument
IO
AlmSummary
Comms
Commstab
Loop
1
2
Programmer
Program
Diag
Browse Find
Level 2 (Engineer) 3504 v. E2.32

In this example the name 'Top Zone' will be applied to loop 1. The numbers of characters is limited to 11 for both 3504 and 3508 (although truncated to 10 for the 3508).

☺ Custom loop names are over written when the loop is being auto-tuned by the default text 'Loop 1/Loop 2'.

3. Chapter 3 Safety and EMC Information

This controller is manufactured in the UK by Eurotherm Ltd.

Please read this section carefully before installing the controller

This controller is intended for industrial temperature and process control applications when it will meet the requirements of the European Directives on Safety and EMC. If the instrument is used in a manner not specified in this manual, the safety or EMC protection provided by the instrument may be impaired. The installer must ensure the safety and EMC of any particular installation.

3.1 GENERAL

The information contained in this manual is subject to change without notice. While every effort has been made to ensure the accuracy of the information, your supplier shall not be held liable for errors contained herein.

3.1.1 Safety

This controller complies with the European Low Voltage Directive 73/23/EEC, by the application of the safety standard EN 61010.

3.1.2 Electromagnetic compatibility

This controller conforms with the essential protection requirements of the EMC Directive 89/336/EEC, by the application of appropriate product specific international standards. This instrument satisfies the general requirements of the commercial and industrial environments defined in EN 61326. For more information on product compliance refer to the Technical Construction File.

3.1.3 Unpacking and storage

The packaging should contain an instrument mounted in its sleeve, two mounting brackets for panel installation and an Installation & Operating guide. Certain ranges are supplied with an input adapter.

If on receipt, the packaging or the instrument are damaged, do not install the product but contact your supplier. If the instrument is to be stored before use, protect from humidity and dust in an ambient temperature range of -10°C to +70°C.

3.2 Service and repair

This controller has no user serviceable parts. Contact your supplier for repair.

3.2.1 Caution: Charged capacitors

Before removing an instrument from its sleeve, disconnect the supply and wait at least two minutes to allow capacitors to discharge. It may be convenient to partially withdraw the instrument from the sleeve, then pause before completing the removal. In any case, avoid touching the exposed electronics of an instrument when withdrawing it from the sleeve.

Failure to observe these precautions may cause damage to components of the instrument or some discomfort to the user.

3.2.2 Electrostatic discharge precautions

When the controller is removed from its sleeve, some of the exposed electronic components are vulnerable to damage by electrostatic discharge from someone handling the controller. To avoid this, before handling the unplugged controller discharge yourself to ground.

3.2.3 Cleaning

Do not use water or water based products to clean labels or they will become illegible. Isopropyl alcohol may be used to clean labels. A mild soap solution may be used to clean other exterior surfaces of the product.

3.3 Installation Safety Requirements

3.3.1 Safety Symbols

Various symbols are used on the instrument, they have the following meaning:

Caution (refer to the accompanying documents Protective Conductor Terminal

3.3.2 Personnel

Installation must only be carried out by suitably qualified personnel.

3.3.3 Enclosure of live parts

To prevent hands or metal tools touching parts that may be electrically live, the controller must be installed in an enclosure.

3.3.4 *Caution:* Live sensors

The controller is designed to operate with the temperature sensor connected directly to an electrical heating element. However, you must ensure that service personnel do not touch connections to these inputs while they are live. With a live sensor, all cables, connectors and switches for connecting the sensor must be mains rated.

The logic IO is not isolated from the PV inputs and all cables, connectors and switches for connecting the sensor must be mains rated.

3.3.5 Wiring

It is important to connect the controller in accordance with the wiring data given in this guide. Take particular care not to connect AC supplies to the low voltage sensor input or other low level inputs and outputs. Only use copper conductors for connections (except thermocouple inputs) and ensure that the wiring of installations comply with all local wiring regulations. For example in the UK use the latest version of the IEE wiring regulations, (BS7671). In the USA use NEC Class 1 wiring methods.

3.3.6 Power Isolation

The installation must include a power isolating switch or circuit breaker. The device should be mounted in close proximity to the controller, within easy reach of the operator and marked as the disconnecting device for the instrument.

3.3.7 Overcurrent protection

The power supply to the system should be fused appropriately to protect the cabling to the units.

3.3.8 Voltage rating

The maximum continuous voltage applied between any of the following terminals must not exceed 264Vac:

- relay output to logic, dc or sensor connections;
- any connection to ground.

The controller must not be wired to a three phase supply with an unearthed star connection. Under fault conditions such a supply could rise above 264Vac with respect to ground and the product would not be safe.

3.3.9 Conductive pollution

Electrically conductive pollution must be excluded from the cabinet in which the controller is mounted. For example, carbon dust is a form of electrically conductive pollution. To secure a suitable atmosphere, install an air filter to the air intake of the cabinet. Where condensation is likely, for example at low temperatures, include a thermostatically controlled heater in the cabinet.

This product has been designed to conform to BSEN61010 installation category II, pollution degree 2. These are defined as follows:-

3.3.10 Installation Category II

The rated impulse voltage for equipment on nominal 230V supply is 2500V.

3.3.10.1 Pollution Degree 2

Normally only non conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

3.3.11 Grounding of the Temperature Sensor Shield

In some installations it is common practice to replace the temperature sensor while the controller is still powered up. Under these conditions, as additional protection against electric shock, we recommend that the shield of the temperature sensor is grounded. Do not rely on grounding through the framework of the machine.

3.3.12 Over-Temperature Protection

When designing any control system it is essential to consider what will happen if any part of the system should fail. In temperature control applications the primary danger is that the heating will remain constantly on. Apart from spoiling the product, this could damage any process machinery being controlled, or even cause a fire.

Reasons why the heating might remain constantly on include:

- the temperature sensor becoming detached from the process
- thermocouple wiring becoming short circuit;
- the controller failing with its heating output constantly on
- an external valve or contactor sticking in the heating condition
- the controller setpoint set too high.

Where damage or injury is possible, we recommend fitting a separate over-temperature protection unit, with an independent temperature sensor, which will isolate the heating circuit.

Please note that the alarm relays within the controller will not give protection under all failure conditions.

3.4 Installation Requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary as follows:

- For general guidance refer to EMC Installation Guide, HA025464.
- When using relay outputs it may be necessary to fit a filter suitable for suppressing the conducted emissions. The filter requirements will depend on the type of load. For typical applications we recommend Schaffner FN321 or FN612.
- If the unit is used in table top equipment which is plugged into a standard power socket, then it is likely that compliance to the commercial and light industrial emissions standard is required. In this case to meet the conducted emissions requirement, a suitable mains filter should be installed. We recommend Schaffner types FN321 and FN612.

3.4.1 Routing of wires

To minimise the pick-up of electrical noise, the low voltage DC connections and the sensor input wiring should be routed away from high-current power cables. Where it is impractical to do this, use shielded cables with the shield grounded at both ends. In general keep cable lengths to a minimum.

4. Chapter 4 Technical Specification

All figures quoted at an ambient temperature from 0 to 50°C unless otherwise stated.

4.1 Control Options

No. of Loops	2
Control Loops	On/Off, single PID
Control Outputs	Analogue, Time proportioned or
	Motorised Valve control with or without feedback.
Cooling Algorithms	Linear, Water, Fan, Oil
Auto/Manual Control	Bumpless transfer or forced manual output.
Setpoint rate Limit	Off to 9999.9 engineering units per minute
Motorised Valve Control	Valve Position bounded or unbounded. Individual
	Valve Positions for heat and cool
Tuning	One-shot Auto tune or Manual.
Loop Alarms	High absolute, Low absolute, Deviation high, Deviation low, Deviation band,
	All with separate hysteresis.
Application Specific	Humidity control

4.2 Display

3504	Primary Large 5 digit display, Information centre 16 character header and 3 lines of 20 characters
3508	Primary Large 41/2 digit display,
	Information centre 8 character header and 3 lines of 10 characters
Technology	LCD with yellow/green backlight
	Red alarm beacon

4.3 Standard Digital I/O

Allocation	2 Off. Not isolated from each other. Not isolated from the PV inputs
	Logic Bi-directional input/outputs
	Logic or Contact closure input
Digital inputs	Voltage level: input Inactive 0 to 7.3Vdc, Active 10.8V to 24Vdc
	Contact closure: input active <480ohms, inactive >1200ohms
Digital outputs	18Vdc at 15mA drive capability, 9mA minimum
Changeover relay	Contact rating Min Load 1mA at 1V Max Load 2A at 264Vac resistive
	1,000,000 operations with addition of external snubber

4.4 All Analogue and PV Inputs

Sample rate	9Hz (110msec.)
Input filtering	OFF to 999.9 seconds of filter time constant (f.t.c.). Default setting is 1.6 seconds
User calibration	Both the user calibration and a transducer scaling can be applied.
Sensor break	a.c. sensor break on each input (i.e. fast responding and no dc errors with high impedance sources).
Ranges	mV, mA, volts -2V to +10V, -1V to +2V or RTD (pt100), pyrometer inputs
Thermocouple types	Most linearisations including K, J, T, R, B, S, N, L, PII, C, D, E with linearisation error < ±0.2°C
	CJC: Automatic (internal), external, 0°C, 45°C, 50°C reference blocks
General	Resolution (noise free) is quoted as a typical figure with f.t.c. set to the default value = 1.6 second.
	Resolution generally improves by a factor of two with every quadrupling of f.t.c.
	Calibration is quoted as offset error + percentage error of absolute reading at ambient temperature of 25°C
	Drift is quoted as extra offset and absolute reading errors per degree of ambient change from 25°C.

4.5 PV Input

Accuracy	±0.1% ±1lsd	
Sample rate	9Hz	
Input filter	Off, 0.2s to 60s filter time constant. Default setting 1.6s.	
40mV Range	Range	-40mV to +40mV
	Resolution	1.9µV (unfiltered)
	Measurement noise	1.0µV peak to peak with 1.6s input filter.
	Linearity error	0.003% (best fit straight line)
	Calibration error	±4.6µV ±0.053% of measurement, at 25C ambient.
	Temperature coefficient	±0.2µV/C ±28ppm/C of measurement, from 25C ambient.
	Input leakage current	±14nA
	Input resistance	100MΩ
80mV Range	Range	-80mV to +80mV
	Resolution	3.2µV
	Measurement noise	3.3µV peak to peak with 1.6s input filter.
	Linearity error	0.003% (best fit straight line)
	Calibration error	±7.5µV ±0.052% of measurement, at 25C ambient.
	Temperature coefficient	±0.2µV/C ±28ppm/C of measurement, from 25C ambient.
	Input leakage current	±14nA
	Input resistance	100MΩ
2V Range	Range	-1.4V to +2.0V
	Resolution	82µV
	Measurement noise	90µV peak to peak with 1.6s input filter.
	Linearity error	0.015% (best fit straight line)
	Calibration error	±420µV ±0.044% of measurement, at 25C ambient.
	Temperature coefficient	±125µV/C ±28ppm/C of measurement, from 25C ambient.
	Input leakage current	±14nA
	Input resistance	100MΩ
10V Range	Range	-3.0V to +10V

	Resolution	500µV
	Measurement noise	550µV peak to peak with 1.6s input filter.
	Linearity error	0.007% for zero source resistance (best fit straight line) Add 0.003% for each 10Ω of source + lead resistance.
	Calibration error	±1.5mV ±0.063% of measurement, at 25C ambient.
	Temperature coefficient	±66µV/C ±60ppm/C of measurement, from 25C ambient.
	Input resistance	62.5kΩ to 667kΩ depending on input voltage.
PT100	Range	0 to 400Ω (-200C to +850C)
	Resolution	50mC
	Measurement noise	50mC peak to peak with 1.6s input filter.
	Linearity error	0.033% (best fit straight line)
	Calibration error	±310mC ±0.023% of measurement in C, at 25C ambient.
	Temperature coefficient	±10mC/C ±25ppm/C of measurement in C, from 25C ambient.
	Lead Resistance	0Ω to 22Ω, matched lead resistances.
	Bulb current	200µA
Thermocouple	Uses 40mV and 80mV ranges.	
	Types	J, K, L, R, B, N, T, S, PL2 and C.
	Linearisation error	±0.2C
	Internal Cold Junction	
	Calibration error	±1.0C at 25C ambient.
	Ambient rejection ratio	40:1 from 25C ambient.
	External Cold Junction	0C, 45C and 50C.

4.6 Analogue Input Module

mV input	100mV range - used for thermocouple, linear mV source, or 0-20mA with 2.49Ω external burden resistor.
	Calibration: ± 10μV + 0.2% of reading
	Resolution: 6μV
	Drift: < ± 0.2μV + 0.004% of reading per °C
	Input impedance: >10MΩ, Leakage: <10nA
0 - 2Vdc input	-0.2V to +2.0V range - used for zirconia.
	Calibration: ± 2mV + 0.2% of reading
	Resolution: 30μV
	Drift: < ± 0.1mV + 0.004% of reading per °C
	Input impedance: >10MΩ, Leakage: <20nA
0 - 10Vdc input	-3V to +10.0V range - used for voltage input.
	Calibration: ± 2mV + 0.2% of reading
	Resolution: 200μV
	Drift: < ± 0.1mV + 0.02% of reading per °C
	Input impedance: >69KΩ
Pt100 input	0 to 400ohms (-200°C to +850°C), 3 matched wires - up to 22Ω in each lead without errors.
	Calibration: ±(0.4°C + 0.15% of reading in °C)
	Resolution: 0.08°C
	Drift: < ±(0.015°C + 0.005% of reading in °C) per °C
	Bulb current: 0.3mA.
Thermocouple	Internal compensation: CJC rejection ratio >25:1 typical.
	CJ Temperature calibration error at 25°C: <± 2°C
	0°C, 45°C and 50°C external compensation available.

4.7 Digital Input Modules

Module type	Triple contact input, Triple logic input
Contact closure	Active <100ohms, inactive >28kohms
Logic inputs	Current sinking : active 10.8Vdc to 30Vdc at 2.5mA
	inactive -3 to 5Vdc at <-0.4mA

4.8 Digital Output Modules

Module types	Single relay, dual relay, single triac, dual triac, triple logic module (isolated)
Relay rating	2A, 264Vac resistive (100mA, 12V minimum)
Single Logic drive	12Vdc at 24mA
Triple logic drive	12V at 9mA per output
Triac rating	0.75A, 264Vac resistive

4.9 Analogue Output Modules

Module types	1 channel DC control, 1 channel DC retransmission (5 max.) and dual channel
Range	0-20mA, 0-10Vdc
Resolution	1 part in 10,000 (2,000-noise free) 0.5% accurate for retransmission
	1 part in 10,000 2.5% accurate for control

4.10 Transmitter PSU

Transmitter	24Vdc at 20mA

4.11 Transducer PSU

Bridge voltage	Software selectable 5 or 10Vdc
Bridge resistance	300Ω to 15KΩ
Internal shunt resistor	30.1KΩ at 0.25%, used for calibration of 350Ω bridge at 80%

4.12 Potentiometer Input

Pot resistance	100Ω to 15KΩ, excitation of 0.5 volts

4.13 Digital communications

Allocation	2 modules fitted in slots H & J (isolated)
Modbus: EIBisynch	RS232, 2 wire or 4 wire RS485, max baud 19.2KB in H module & 9.6KB in J module
Profibus DP	High Speed, RS485, 1.5Mbaud (**Slot H only**)
Ethernet (Modbus TCP)	Modbus TCP at IO Base T - slot H only
DeviceNet	Maximum baud rate 500KB - slot H only

4.14 Master communications

Allocation	Slot J
Modbus	RS485 4-wire or RS232
Parameters	Single parameter master communications

4.15 Alarms

No of Alarms	8 Analogue, 8 digital. Can be wired to any internal parameter. Sensor break alarms are independent from Analogue Alarms. Digital alarms can be + edge, - edge or edge triggered.
Alarm types	Full scale, deviation, sensor break plus application specific
Modes	Latching or non-latching, blocking, time delay

4.16 Setpoint programmer

Programmer modes	Dual programmer – can be configured as two individual single programmers, synchronised start programmer or synchronise in all segments programmer
Programmer types	Time to Target or Ramp Rate
No of programs	A maximum of 50 programs. Programs can be given user defined 16 character names
No of segments	500 segments total or 50 maximum per program
Event outputs	Up to 8, can be assigned individually to segments or called as part of an event group

4.17 I/O Expander

10 I/O version	4 changeover relays, 6 normally open relay contacts, 10 logic inputs
20 I/O version	4 changeover relays, 16 normally open relay contacts, 20 logic inputs

4.18 Advanced functions

Timers	4, On Pulse, Off delay, one shot and min-On
Totalisers	2, trigger level & reset input
Counters	2, up or down counters
Real time clock	Day of week and time
Application blocks	24 digital operations
	24 analogue operations
	2 eight input logic operators, 2 eight input analogue operators
	16 user values
	BCD input
	Customised input linearisations
	Mathematical Add, Subtract, Multiply, Divide, Constant, Absolute difference, Maximum, Minimum, Sample and Hold, Input 1 to the power of input 2, Square root, Log(10), Ln, 10 to the power of input 1, i.e. to the power of input 1
	Logical AND, OR, XOR, Latch, Equal, Not Equal, Greater than, Less than, Greater than or
	equal to, Less than or equal to.
	Humidity Wet and dry bulb technique
	Multi operator block – minimum, maximum, average and sum

Software Tools	iTools Configuration Tool
	OPC Scope Trending and Data logging
	iClone Lite Lightweight configuration cloning
	Graphical Wiring Editor Drag and drop wiring tool, self-documenting
	View Builder Custom Animation Screens
	iTools Wizard Question and Answer configuration screens

4.19 General specification

Supply	100 to 240Vac -15%, +10%. 48 to 62Hz. 20 watts max
	Low voltage supply: 24Vac/dc, -15%, +10%
Inrush Current	High Voltage controller – 30A duration 100µs
	Low Voltage controller – 15A duration 100µs
Operating ambient	0°C - 50°C (32°F to 131°F) and 5 to 95% RH non condensing
Storage temp	-10°C to +70°C (14°F to 158°F)
Panel sealing	IP65, plug in from front panel
Dimensions and weight	
3504	96H x 96W x 150D (mm) 0.6kg
3508	96H x 48W x 150D (mm) 0.4kg
Electromagnetic compatibility	EN61326-1 Suitable for domestic, commercial and light industrial as well as heavy industrial environments. (Class B emissions, Industrial Environment immunity).
	With Ethernet or DeviceNet module fitted product is only suitable for industrial environments, (class A emissions).
Safety standards	EN61010, installation category II (voltage transients must not exceed 2.5kV), pollution degree 2.
Atmospheres	Not suitable for use above 2000m or in explosive or corrosive atmospheres

CE This controller meets the European directives on safety and EMC

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